ANNUAL REPORT OF THE NEBRASKA STATE BOARD OF AGRICULTURE

BY W. R. MELLOR 1908

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ANNUAL REPORT

NEBRASKA

State Board of Agriculture

FOR THE YEAR 1908

PREPARED BY
W. R. MELLOR, SECRETARY.

LINCOLN, NEBRASKA:
STATE JOURNAL COMPANY.
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STATE BOARD OF AGRICULTURE.

Office of Secretary,
Lincoln, Neb., January 30, 1908.

His Excellency George Lawson Sheldon, Governor of Nebraska:

Sir: In compliance with the law in this case made and provided, I hereby transmit the annual report of the Nebraska State Board of Agriculture for the year 1908.

Very respectfully,
W. R. MELLOR, Secretary.

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PROCEEDINGS.

SEMI-ANNUAL MEETING

LINCOLN, NEB., September 5, 1907.

The semi-annual meeting of the State Board of Agriculture was held the 5th day of September, A. D. 1907, in the office of the Board of Managers, pursuant to notices delivered and posted.

Members present: Youngers, Rudge, Arnold, Russell, Mellor, Cook, Hervey, Filley, Hendershot, James, Mickey, McArdle, Leonard, Haws, Caley, Lewelling, Ollis, Searle, Pritchard, Bessey, Mann, Bassett, Dickman, Atkins, Roberts, Foster and Wolcott.

Absent: Apperson and Morse.

Meeting called to order by President Youngers.

Roll call and reading of minutes of last annual meeting dispensed with on motion.

On motion, Mr. O. P. Hendershot was elected a delegate to represent this Board at the annual meeting of the American Shorthorn Breeders Association to be held in Chicago the first week in December.

On motion, Peter Youngers and W. R. Mellor were elected delegates to attend the annual meeting of the American Association of state fairs to be held at Chicago the first week in December.

The following petition from exhibitiors in Agricultural Hall was presented and, on motion, was referred to the incoming Board of Managers for action:

STATE FAIR GROUNDS, September 5, 1907.

We, the undersigned exhibitors, wish to express our appreciation of the management of Agricultural Hall during the 1907 fair and respectfully request the incoming officers and Board of Managers to appoint Mr. William James to the position of superintendent of Agricultural Hall for the year 1908.

Kearney County—R. W. Wait, Edward Krick, T. B. Keedle.
Saline County—William Lowe.
Franklin County—W. H. Arnold.
Howard County—Z. T. Leftwick.
York County—M. B. Atkins.
Red Willow County—Stephen Bolles.
Webster County—L. C. Peisiger, G. W. Hummel.

Brown County—A. McSweeney, W. H. Peck.
Scott's Bluff County—W. Clark.
Keya Paha County—L. A. Wilson.
Douglas County—J. W. Long, J. W. Shumaker, Geo. Dierks, A. R. Dodson.
Furnas County—C. E. Laverack.
Nemaha County—O. P. Dovel, Oscar Debrose, W. K. Blount.
Washington County—Jno. H. Ballard.
Pawnee County—A. Martin.
Lincoln County—T. E. Jackson.
Perkins County—Wm. F. Edwards.
Frontier County—Loyal M. Graham.
Colorado State Exhibit—W. G. Brandenburg.
Antelope County—W. H. Cole.

Chairman Rudge made a detailed explanation of the improvements made upon the fair grounds during the past summer, specifically detailing the filling of the low ground west of the Administration Building, the moving of the speed barns to the north of the race track, the moving of the thirteen swine barns from the extreme east side of the grounds to the filled portion on the extreme west, and the building of seven new swine barns and the new fish building, the laying of about 1,300 feet of sewer from the present live stock pavillion to horse shoe lake and the laying of over 1,700 feet of water mains from ladies' comfort building around the west end of race track to speed barns.

On motion, the request of the exhibitors in Class F, that the following petition be spread upon our records and a copy of same be forwarded to Judges of Class F, was ordered granted:

State Fair Grounds, September 5, 1907.

We, the undersigned exhibitors, wish to express our appreciation of the fair and impartial treatment by extending a vote of thanks to Messrs. E. G. Montgomery, E. E. Smith, and Charles Grau judges in Class F.

John H. Ballard, Washington County.
Arnold Martin, Pawnee County.
M. B. Atkins, York County.
Chas. N. Schmale, Lancaster County.
C. N. Toops, Lancaster County.
L. E. Jackson, Lancaster County.
Wm. F. Edwards, Perkins County.
Ed. Krick, Kearney County.
T. B. Keedle, Kearney County.
W. H. Arnold, Franklin County.
Loyal M. Graham, Frontier County.
A. R. Dodson, Douglas County.
O. P. Dovel, Nemaha County.
L. A. Wilson, Keya Paha County.
Z. T. Leftwich, Howard County.

L. C. Peisiger, Webster County.
G. W. Hummel, Webster County.
T. M. Nichol, Antelope County.
T. D. Deutsch, Scott's Bluff County.
H. Stowe, Furnas County.
C. E. Laverack, Furnas County.
Stephen Bolles, Red Willow County.
J. W. Long, Douglas County.
J. W. Shumaker, Douglas County.
George Dierks, Douglas County.

On motion, the Board of Managers were instructed to continue with grading of the low lands north of Morton avenue and to make any further improvements which may be considered for the good of the Association.

On motion meeting adjourned.

W. R. MELLOR, Secretary.

ANNUAL MEETING.

TUESDAY, JANUARY 21, 1908 at 4:30 P. M.

Meeting called to order by President Peter Youngers.

President Youngers: The house will please come to order. The first thing will be the reading of the call for the annual meeting.

CALL FOR ANNUAL MEETING.

LINCOLN, NEB., November 29, 1907.

DEAR SIR: Notice is hereby given that the annual meeting of the Nebraska State Board of Agriculture, for the revision of rules, regulations and premium list, and the election of members and officers will be held in Convention Hall, Lindell Hotel, Lincoln, Neb., on Tuesday, January 21, 1908, at 4 o'clock P. M.

Presidents of regularly organized live county agricultural societies which have filed their report prior to this meeting, are ex-officio members of the Board. If the president cannot attend, then the society must elect a delegate and file authenticated credentials. No proxies are admissible.

The following committees have been appointed by President Peter Youngers:

REVISION OF PREMIUM LIST, RULES AND REGULATIONS.

S. C. Bassett, Chairman; G. W. Hervey, O. P. Hendershot,
Gibbon. Omaha. Hebron.
L. W. Leonard, O. E. Mickey,
Pawnee City. Osceola.

This committee to report Friday, January 17, 1908, at 7 o'clock P. M.

AUDITING COMMITTEE.

Geo. F. Dickman, E. M. Searle, Jr., Wm. Foster,
Seward. Ogalalla. Lincoln.

This committee to report Monday, January 20, 1908, at 7 o'clock P. M.

CREDENTIALS AND RETURNS.

Jos. Roberts, Dr. H. Pritchard, J. A. Ollis, Jr.,
Fremont. Wisner. Ord.

This committee to report Monday, January 20, 1908, at 7 o'clock P. M.

MEMBERS WHOSE TERMS EXPIRE JANUARY, 1908.

Chas. Mann, Dawes County.
V. Arnold, Richardson County.
S. C. Bassett, Buffalo County.
W. A. Apperson, Johnson County.

Geo. F. Dickman, Seward County.
W. R. Mellor, Sherman County.
L. Morse, Dundy County.
M. B. Atkins, York County.
Peter Youngers, Jr., Fillmore County.
G. W. Hervey, Douglas County.
Jos. Roberts, Dodge County.
William Foster, Lancaster County.
R. M. Wolcott, Merrick County.
E. Z. Russell, Washington County.

MEMBERS WHOSE TERMS EXPIRE JANUARY, 1909.

C. H. Rudge, Lancaster County.
Wm. James, Saline County.
O. P. Hendershot, Thayer County.
O. E. Mickey, Polk County.
Jno. F. McArdle, Douglas County.
L. W. Leonard, Pawnee County.
H. L. Cook, Howard County.
I. W. Haws, Kearney County.
W. C. Caley, Knox County.
Elijah Filley, Jefferson County.
C. M. Lewelling, Furnas County.
J. A. Ollis, Jr., Valley County.
E. M. Searle, Jr., Keith County.
Dr. H. Pritchard, Cuming County.
Chas. Bessey, Webster County.

Peter Youngers,
President.

W. R. Mellor,
Secretary.

President Youngers: The Secretary will call the roll.

Secretary Mellor calls the roll and announces there is a quorum present.

President Youngers: Is the Committee on Credentials ready to report?

Mr. Roberts: The credentials have not all been handed in, but we are ready to report on those that have.

President Youngers: Are there any delegates present who have not handed in their credentials?

Mr. Dickman: The president of the Seward County Agricultural Society is here and entitled to a vote.

Secretary Mellor: Do you know if his report has been filed, Mr. Dickman?

Mr. Dickman: I gave it to the secretary of the county society, but he has not yet sent it in.

Secretary Mellor: I will furnish you with a blank and you can have your president fill out same and hand to the Committee on Credentials, supplying any minor details which he may not now remember.

President Youngers: We will now listen to the report of the Committee on Credentials.

Mr. Roberts read the following report:

REPORT OF COMMITTEE ON CREDENTIALS.

To the Officers and Members of the Nebraska State Board of Agriculture:

We, your Committee on Credentials, respectfully submit the following report. We find the following named persons entitled to seats as representatives of their various societies in this meeting:

Boone County—H. L. Brooks, Delegate.
Brown County—W. H. Peck, President.

Clay County—Ralph H. Searle, President.
Custer County—H. M. Sullivan, President.
Dawes County—Chas. Mann, President.
Douglas County—J. W. Shumaker, President.
Dundy County—L. Morse, President.
Fillmore County—A. J. Brown, Delegate.
Franklin County—George C. Shepard, President.
Frontier County—Loyal M. Graham, Delegate.
Furnas County—C. E. Laverack, Delegate.
Gage County—H. V. Riesen, Delegate.
Greeley County—M. F. O'Malley, President.
Hamilton County—S. B. Otto, Delegate.
Harlan County—A. C. Shallenberger, President.
Hitchcock County—W. Z. Taylor, Delegate.
Holt County—J. D. Grimes, President.
Johnson County—P. H. Hopkins, President.
Kearney County—T. B. Keedle, Delegate.
Knox County—J. K. Brown, President.
Lancaster County—S. R. Hall, President.
Madison County—J. Q. Wakely, President.
Nuckolls County—F. E. Bottenfield, President.
Nemaha County—H. R. Howe, President.
Pawnee County—J. D. Albright, President.
Polk County—L. K. McGaw, President.
Red Willow County—John W. Dutcher, President.
Seward County—C. A. Richie, President.
Saunders County—S. W. Martin, Delegate.
Scott's Bluff County—Fred D. Wolt, President.
Sherman County—H. J. Johansen, Delegate.
Stanton County—Charles McLeod, President.
Valley County—W. J. Hather, Delegate.
York County—T. W. Smith, President.

Respectfully submitted,
JOSEPH ROBERTS,
H. PRITCHARD,
J. A. OLLIS, JR.,
Committee on Credentials.

Mr. Ollis: I move that the report be accepted so far as read, and the committee be granted until tomorrow morning to make a further report, so if others come in for the morning session, they may secure representation.

Mr. Russell: I second the motion.

President Youngers: You have heard the motion. Are you ready for the question? (Question.) All in favor say Aye. Contrary, No. The ayes have it. It is so ordered. The next thing in order will be the President's address.

PRESIDENT'S ADDRESS.

To the Officers and Members of the Nebraska State Board of Agriculture, Greeting:

Again we meet in annual session, and in reviewing the past year we have many reasons for being thankful and encouraged to better efforts. The rapid advance and permanent character of the work in upbuilding the agricultural interests of the state during 1907, by the State Board will leave its imprint for years to come.

The recent financial flurry caused deep concern in New York, and generally throughout the east, the supposed financial Gibraltar of North America, and our banks had millons of deposits with the eastern banks that they could not return; but it was not necessary for the New York banks to return the millions of our farmers' money, for we had plenty of resources left in Nebraska to fully feed, care for and conduct all of the necessary financial transactions of our prosperous commonwealth. With the enormous live stock interests, with millions of bushels of surplus corn, wheat and oats, and millions of tons of hay selling, as a rule at satisfactory prices, we surely have reason to rejoice that we live in this land of sunshine and prosperity.

THE NEBRASKA STATE FAIR.

The exhibits in every department were complete and it taxed the management to the utmost to furnish space for many lines of exhibits.

The improvements during the past year and additional improvements now under construction will in a large measure remedy the lack of space the coming season. The following improvements added largely to the beauty of the grounds and comfort of the visitors:

Painting all buildings on the fair grounds.

The new fish building, where many thousands viewed the fish in comfort and safety, as viewing the fish from the outside instead of passing through the building is a new departure in fish buildings.

Grading the location for the swine barns, moving the same and erecting seven new barns materially assisted in caring for this very important branch of exhibits.

Removing the old speed barns, remodeling the same, has added much to the appearance of the grounds and affords the speed department much better accommodations, which were appreciated.

In addition to the above, water mains with fire plugs were laid to the speed barns, thus furnishing them the necessary protection. Sewers were dug connecting with the city sewerage, thereby insuring sanitary conditions. It required the expenditure of $33,000 to secure the improvements named, and while the improvements are great and much has been accomplished in a very short time, we must make more and better efforts the coming season, and we will, no doubt, advance and improve more rapidly, for we are progressing as a state, and our fair grounds will keep pace with the enterprise of the citizens of Nebraska.

The Board is under special obligations to C. H. Rudge and H. L. Cook for their untiring effort in overseeing the details of the work of construction. They devoted many weeks of valuable time urging and encouraging the work, in order to have all in order and ready on the opening day.

The last legislature appropriated $20,000 for a new cattle barn and the foundation and part of the walls are already built and will, when complete, add much to the comfort of the exhibitors and also assist the Superintendent in his labors. This building will be one of the largest buildings of its kind in the west, 174 by 255 feet with a capacity of over six hundred head of cattle. It is but a fitting tribute to the breeder of fine cattle that they should have fine shelter during the fair week, as the live stock interest is the largest interest in Nebraska.

RECOMMENDATIONS.

1st. Complete information bureau, where visitors can get prompt and reliable information.

2d. A large bulletin board announcing the departure and arrival of trains.

3d. New addition to grand stand, as the present stand is entirely too small for present needs.

4th. New Agricultural Hall.

5th. Suitable building for educational exhibit.

6th. Better accommodations for the forage department. I would urge that all the improvements outlined above be secured as soon as funds are available for this purpose.

SECRETARY'S OFFICE.

Through your wise action the Secretary is now compelled to maintain an office in Lincoln, which is located in the state house and is always open to the public, requiring the entire time of the secretary, while in former years the secretary resided at his home and could attend to his personal as well as his official duties. The expense and work has thus been increased by reason of being located in the city of Lincoln, and the salary has not been increased to meet this extra outlay. I would therefore recommend some substantial increase in the salary of the secretary.

I would also recommend that the Board of Managers confer with the Traction and Citizens' Street Railway companies with a view to having the roads enter the fair grounds at some convenient point, instead of compelling our patrons to walk into the grounds as under the present arrangement.

Ever mindful of the good work of the superintendents and others employed to make the fair a success, I desire to express my kind appreciation of their efforts to please our visitors. I fully realize that the success of the fair the past year was due to the kindness of the exhibitors and painstaking efforts of the officers toward the patrons, which has caused a feeling of good will toward the State Board of Agriculture.

In returning into your hands the office of President with which you have honored me, I retire with a feeling of good will to all connected with the Board, and I assure you I will ever appreciate the kindness of the Board of Managers, Secretary and every member of the Board, for their assistance to me in the discharge of my official duties, and my hope and desire is that you will give my successor the same loyal support that has been accorded me. I thank you.

PETER YOUNGERS.

President Youngers: We will now listen to the report of the Secretary.

Mr. Mellor: I have here a letter from the secretary of the Commercial Club which I would like to read to the people present. (Reads as follows:)

LINCOLN COMMERCIAL CLUB.

LINCOLN, NEB., January 21, 1908.

Mr. W. R. Mellor, Secretary, Board of Agriculture, City.

DEAR SIR: The Lincoln Commercial Club desires to extend a most cordial welcome to all delegates to the meetings of Organized Agriculture held in Lincoln during the current week, and to extend to each and every one the full privileges of the club rooms while they are in the city.

I think we can safely say that every member of the Commercial Club has taken great interest in meetings of Organized Agriculture, and that you will find the club as anxious in the future as it has been in the past to co-operate with the officers of your organization to make these meetings of more importance each succeeding year.

The officers of the club invite suggestions from delegates and officers of your association as to how their services can be made more efficient. We are all vitally interested in the development of our agricultural lines, and the interest manifested by the people throughout the state is in our opinion the best guarantee to the officers of the meetings of Organized Agriculture that their efforts are appreciated, and that immense good has already come out of these important meetings is reflected from almost every farm in the best state in the Union, Nebraska.

With all best wishes for the most successful meeting yet held, and trusting that we will have the pleasure of entertaining you again next year, I am cordially yours,

W. S. WHITTEN, Secretary.

REPORT OF SECRETARY.

To the Officers and Members of the Nebraska State Board of Agriculture, Greeting:

Nebraska, as an agricultural state, is commanding the attention of the markets of the world to a greater degree with each succeeding year. A new state which successfully holds the position in the front rank of the agricultural column is deserving of the constantly increasing favorable consideration by the comparisons with which we are favored. Only two or three states of the Union can now show greater quantities of production in any of the leading staple crops grown in this latitude, than can Nebraska.

The year 1907, however, has not been a banner year in crop production owing to unseasonable rainfall in the eastern, and lack of rainfall in the western and central parts of our state, but this condition being general over the entire agricultural portion of the central west, has caused a general crop reduction with resultant high prices.

As usual, corn has been our predominant crop and although the 1907 crop is fully 25 per cent less in number of bushels than that of 1906, still its commercial value is greater. The yield for 1907 as gathered by our state statistician as to our principal crops are:

Corn	169,732,885	bushels
Wheat	46,207,658	bushels
Oats	53,622,262	bushels
Rye	1,407,699	bushels
Barley	2,246,166	bushels
Potatoes	6,262,220	bushels
Hay	4,011,648	tons
Alfalfa	1,450,759	tons

It is a matter of some interest to many of us to know which counties produce the greatest quantities of our principal crops, and by a careful analysis we find the banner counties for 1907 are as follows:

Corn—Cass, Otoe, Saunders, Gage, and Lancaster, with an aggregate yield of 26,272,036 bushels, or more than one-seventh of the entire reported yield.

Wheat—Clay, Hamilton, Fillmore, York and Adams with 8,942,961 bushels or more than one-sixth the crop of the state.

Oats—Antelope, Cedar, Madison, Boone and Knox raised 8,448,955 bushels or about one-sixth of all produced.

Rye—Deuel, Holt, Cheyenne, Custer and Frontier whose yield was 381,656 bushels or one-fourth of the rye raised in Nebraska.

Barley—Frontier, Hitchcock, Red Willow, Dundy and Hayes raised 978,753 bushels or more than two-fifths of the entire production.

Potatoes—Douglas, Box Butte, Sheridan, Scott's Bluff and Cherry, 1,806,657 bushels or two-sevenths of the crop.

Hay—Holt, Cherry, Dodge, Saunders and Richardson 697,629 tons, being one-sixth of the production.

Alfalfa—Buffalo, Dawson, Custer, Webster and Nuckolls 366,319 tons or one-fourth of the production.

From a study of these facts we find that the centers for the various crops were well distributed over the state. Corn, being especially prominent from its yield in the southeast corner of the state; wheat in the southern-central; oats in the northeastern; rye in the central western; barley in the southwestern; potatoes, outside of the market gardeners near Omaha, in the northwestern; hay along the Missouri and Platte rivers and alfalfa in the central.

Besides these centers for the standard crops, Nebraska is credited with having the greatest production and shipment of vine seeds from Waterloo that there is from any one station in the central west, and also that one-eighth of the commercial pop-corn used in the United States comes from North Loup.

Nebraska is credited by the late United States government report as having raised in the year 1907 more than one-twelfth of all the corn, one-tenth of all the winter wheat and one-fifteenth of all oats raised in the United States.

From deductions made we find that Nebraska has about one-fifteenth of the entire wealth-producing, agricultural power of this nation, therefore is it any wonder that the farmers of our state treated the passing financial panic as of such light importance that scarcely a single country bank in Nebraska failed to pay cash on every check presented, from its deposits of $178,000,000.

We hear of certain sections of the country which have not developed "on account of the ravages of the war of '61 to '65." When we hear such assertions, we at once come to the conclusion that the basic principles of wealth producing from old Mother Earth is lacking in that particular locality. This, by comparison, also brings to our mind the wonderful development of Nebraska in the same period of time. In this state our farmers have produced more than one hundred million dollars worth of the two or three principal products each year for the past ten years, with a like amount additional from their live stock. Does not this fact convince us that the development of Nebraska from a wilderness in 1860—called at that time a part of the Great American Desert—to one of the four leading wealth producing states of the union, is caused by the extreme fertility of our soil, the healthfulness of our climate, coupled with an educated, industrious citizenship who are not content to follow, but who are contending for an advantageous position in the very front rank.

SCHOOL OF AGRICULTURE.

The interest taken by all the people of our state in the development of agricultural education at the University School of Agriculture, has been very marked. Students have come in increased numbers, so that this year for the first time the attendance at the school has exceeded the 500 mark. This growth in numbers and in interest comes from the fact that the instruction offered has a most intimate relation to the daily life of the boy after he leaves the institution and goes back to the farm, giving him not only the ability to increase the productiveness of his land, but also to enrich in many ways the life which he is living on the farm.

This year, also, for the first time, a department of home economics has been established in the school and a class of twenty-three young women are in attendance. Considering the fact that the building to house this department is not completed, and that on this account very little was said about the work to be offered, the attendance is most encouraging and shows that farmers' girls will be anxious to avail themselves of this opportunity for the practical education in home making, now to be offered under most favorable circumstances.

The last legislature appropriated $100,000 for new buildings and improvements to supply the needs of the agricultural school. The women's building is now practically completed. The new heating plant is finished and the pavilion for judging grain and live stock will be completed in a few months. This gives largely increased facilities for the work of the school, but there is evidence that these buildings will all be utilized to the fullest extent as soon as they are completed and equipped.

The success of the farm at the International at Chicago this year as in the past, has done credit to the state. In a show of nearly a thousand fat steers, the state farm showed, in Flynt of Meadow Brook, a pure-bred Angus, the first prize yearling Angus steer and the champion yearling of the show. It also won other prizes, as follows: third prize on two-year-old Angus steer, third on Augus herd of three steers with four special prizes offered by the Angus Association, also second on two-year-old Shorthorn steer with two association specials, also fifth on two-year-old Hereford steer and fifth on herd of three steers, with one Hereford special, also third on two-year-old Galloway steer, fourth on yearling Galloway steer, third on calf and third on three steers in herd; also third in Shorthorn special on two-year-old grade steer, third and fourth in senior yearling grades and fifth in junior yearlings, third in Hereford special on grade calves. In the carcass competition second and fifth prizes were awarded on yearling steers. Two Armour scholarships of $250 each were also awarded to the station on account of the prizes won in open competition making a total of $1,110 won in prizes and scholarships.

It will thus be seen that the men in charge of these departments of our state farm are able to compete with the most experienced of practical breeders in the production of finished beef, as judged by the standards of practical cattle men.

The work of the experiment station in calling attention to economic methods in cattle feeding, through the use of alfalfa has been of immeasurable value to the state. The experiments in developments of new strains of turkey-red wheat with higher yielding power and better milling qualities than that in common use, promises much to the wheat grower of the future. The five years work in cooperation with farmers in different corn regions of the state has given us a more accurate and valuable standard for selection of varieties than we have ever before had. The average yield in the eastern section of the state for the best two varieties under experiment has been fifty-four bushels per acre, while the average yield of all corn in the same counties was but thirty-six bushels; an average increase of eighteen bushels per acre for all the eastern counties. This is good evidence to show that if the best varieties were used and the average standard brought up to that of the best farmers in the neighborhood, an increase of about fifteen to twenty bushels of corn per acre would probably result. The work of the dairy department in testing the value of silage for dairy cows will certainly result in building many silos in the eastern section of the state, as this work has shown the cost of butter production can be reduced about twenty per cent in large dairy herds by the use of the silo.

The work of the western station, located at North Platte, has shown that under good methods of farming great areas of land which have been devoted to grazing can be made profitable farming lands. Winter wheat has been grown successfully each year, the average yield being greater under good methods than the average yield of wheat on the high-priced land in the eastern section of the state.

The land which produced this wheat was purchased by the state in 1904 for $5 per acre. Macaroni wheat, barley, and other spring grains have flourished and have given moderate and sometimes abundant yields. Cane, as a forage plant, has produced large crops. Pork has been grown upon alfalfa pastures and native grown grains at a profit, and all the conditions point to the development of a profitable farming region, where proper care is used in the selection of land, the use of good varieties, and of good methods of tiilage. The information thus far gained would suggest that live stock will always be the leading industry of this section, but that a combination of crop prduction and stock raising will greatly multiply the profits secured from the land.

The work of the farmers' institute, under an efficient corps of instructors, is doing much to disseminate the best agricultural knowledge among the people, so that improved methods may come into more general use. One hundred seventy-five meetings are scheduled for the coming institute season, reaching a large number of farmers in every section of the state.

The men who are responsible for the agricultural progress of the state, should congratulate themselves upon the fact that so much of permanent growth is taking place; that the facilities for investigation of agricultural problems are so generously supported, and that the interest in agricultural education has become so universal. The money which has been expended in these public ways for the improvement of our agriculture has been repaid a hundred fold and the impetus which has been given to general education, to better methods of production, and the development of all our agriculture resources.

THE STATE FAIR.

To this association some of the principal events of the year have been the killing of the bill for one-eighth mill levy for state fair buildings and substitution therefor of a bill for $75,000 for a machinery hall. This, when referred to the house committee, was amended to read "$50,000 for a cattle barn," which passed the house and went to the senate, where the committee cut the amount to $20,000, which was ultimately passed without a dissenting vote, and concurred in by the house. This barn is now in course of erection. The size is 174 by 255 feet and it will hold, when completed, 636 head of cattle. The thirteen swine barns formerly located on the east side of our grounds have been removed to the extreme west edge and, together with seven new barns, are located upon the filled ground west of the Burlington intake. The old speed sheds have been moved from the south end of the race track over to the north side, and remodeled into commodious, modern speed barns. By bringing the dirt from north of the Rock Island switch, about ten acres of the low land west of Administration Building and Burlington intake, has been changed, by the fill of from one to seven feet of earth, into one of the most desirable tracts on the grounds and now furnishes us a location for the future live stock exhibit, and the coming live stock pavilion. A new fish building of an original desgn has been erected, and toilet rooms for ladies to two and one half times the original capacity and one for men have been added to the Public Comfort Building. These improvements will be touched upon more fully in the report of the President and Board of Managers.

LIVE STOCK.

The live stock industry in Nebraska is of a value fully equal to all the soil products combined, therefore it is easily the one most important exhibit at our annual fair. In the past year great advancement has been made in the various departments of live stock and we confidently expect that the 1908 fair will mark the beginning of an era in which Nebraska will be recognized as one of the places in the west for the exhibition of herds of fine stock. At the 1907 state fair the entries were as follows: 267 horses, 911 cattle, 1,503 swine, with 1,851 actually on the grounds, and 203 sheep.

AGRICULTURAL HALL.

Agricultural Hall housed nineteen county collective exhibits which gave a total of 2,745 entries in Class "F," Farm Products. The county collective exhibits were made up of six from the eastern district; nine from the central and four from the western. This was the first year under the district plan and we judge, proved much more satisfactory than did the old plan of open competition for the entire state. We hope that the Premium Revision Committee will remove the handicap on one county in this particular exhibit. The beauty and symmetry with which the entire hall was arranged called forth much praise for the superintendent and exhibitors alike.

HORTICULTURAL.

Although the early frosts caused a great shortage in fruits of nearly all descriptions, still to go through Horticultural Hall during the fair would have convinced you that Nebraska is a fruit country even under the most adverse circumstances. The exhibit was in keeping with the usual excellent ability in which this department is ever conducted and reflects great credit on the membership of the Horticultural Society which is doing much for the betterment and happiness of our farmers.

POULTRY.

The poultry exhibit, with its 1,253 entries, completely filling the large building, was expressive of the wisdom of the committee in limiting the exhibit of professional showmen so that more amateur fanciers might participate in the awards. That this is one of the important industries of the state is clearly demonstrated by the interest manifested by farmers' wives who could always be found in great numbers within the building during the fair.

MERCANTILE, TEXTILE AND FINE ARTS.

It is really a deed of heroism and pride on the part of the exhibitors in the mercantile, textile and art departments to trust their excellent exhibits in the accommodations now provided. When we consider the many rare, and valuable displays made, and the liability of loss, we cannot fail to express our admiration for the loyalty of our exhibitors in providing us each year with most meritorious exhibits in each of these departments. We fear no contradiction when we say that each of these departments maintained the steady advance shown with each succeeding fair.

DAIRY.

This important industry is represented principally by the one splendid annual exhibit of our leading creamery company, together with a line of separators showing the advantages claimed by each exhibitor. At the last fair liberal premiums were offered for a dairy test for Shorthorn cows, but owing to the high standard demanded together with strange conditions caused by the removal of the milch cows from their usual surroundings, it proved a failure. At the last meeting of the Shorthorn Breeders' Association held at Chicago in December, we understand that the standard of test was lowered so as to overcome these conditions to a certain degree; therefore we hope to have a successful test at our coming fair.

EDUCATIONAL.

The stranger who visits our annual exhibit in the educational department may easily realize why Nebraska is at the head of all the states in the union in the smallest percentage of illiteracy. The exhibit shows the skillful care of accomplished hands in its arrangement for display and it is hoped that the handicap of crowded quarters may be overcome during the coming year, by the arrangement of some special building for this excellent department.

APIARY.

The practical demonstration made with bees by one of our energetic exhibitors was instructive and entertaining to our patrons and was a feature of the Bee and Honey exhibit which served to draw added interest thereto. This is a most important lesson to teach our farmers as large profits may be reaped from a small investment and little labor.

MACHINERY.

"More 'red' machinery than I ever saw in one spot in my life," was the way one farmer described this splendid exhibit made by 126 manufacturers and firms. This display was fully one-fifth greater than at any fair heretofore held here in Nebraska. During the year the removal of the swine barns to the new location permitted the enlargement of the machinery grounds so as to cover about two acres more territory than in 1906. The showing made in this department is fully realized by this state board and we wish to here express our appreciation of the labor performed by our exhibitors in this department in their efforts to make this particular exhibit a model of its kind under the handicap of no permanent buildings in which to show.

TRANSPORTATION FACILITIES.

During the past year the transportation facilities to the fair grounds have been increased by the addition of the Citizens' Railway Company's Seventeenth street car line so that with the excellent service of the shuttle trains of the Burlington, the Lincoln Traction Company and the Citizens' lines the transportation problem was the most satisfactory that the state fair has ever known.

NIGHT ENTERTAINMENTS.

With increased transportation facilties comes the opportunity for night attractions, which are leading features of other state fairs and could be made very attractive with running races, althletic events, vaudeville, band and operatic concerts and grand fireworks exhibitions. This departure would necessitate some sort of a lighting plant with a capacity for the large buildings, race track and concessionaires, but as the Nebraska state fair is fast approaching exposition proportions, it is proper that matters for its advancement shall be considered.

ATTRACTIONS.

We have made an initial bow in the securing of two large attractions at the 1907 state fair; the air-ship, which owing to prevailing winds, was somewhat disappointing from the fact that flights were only accomplished at, or near, the sunset hour when the great majority of our patrons had left the grounds. The other special attraction was the Liberati New York Grand Opera and Concert Band which can truly be said was an unqualified success and gave delightful music especially gratifying to music lovers. Our own First Regiment Band divided honors with Liberati and to them no higher compliment can be paid than the repetition of the statement made by a number of the members of Liberati's band when they said "that it was the best country band they had heard." For additional meritorious attractions we hope, as soon as practical, that two theatre buildings and a music hall may be erected so we can give our patrons value received for money expended in the show line, which seems impossible under existing conditions.

SPEED.

We believe there is a closer degree of harmonious friendship between the horseman and this board than has been known for years. During the past year it has been our effort to do, not only that which is done by every other speed association, but to "go them one better" in returning one-half the entry fee to horses finishing outside of the money, with free stall rent to actual starters. This liberal policy resulted in the filling of fifteen harness races on dates regularly set for the closing of entries, which gave us three harness races for each day. This is a welcome departure from the experience of former years, and when we take into consideration that our dates conflict with the grand circuit meeting at Minnesota each year, it is truly a wonderful accomplishment to succeed in securing 201 entries of harness horses for a single meeting. The great need in this department is for more grand stand facilities. It is almost hopeless for us to consider the erection of a steel grand stand similar to those used by other large state fairs, without legislative appropriations; therefore it may be a number of years before Nebraska state fair patrons have such accommodations.

The following is the financial statement in the Speed Department for the year 1907:

RECEIPTS.

Entry fees	$3,825 00
Suspension collections	290 40
Stall rent	4 00
Grand stand concessions	460 00
Amphitheatre tickets	6,645 50
	$11,224 90

EXPENDITURES.

Dues American Trotting Association	$105 00
Suspension fees to Knight	260 90
Advertising	158 65
Exhibition—"Surena"	250 00
Exhibition—"Dr. Tom"	300 00
Exhibition races	25 00
Athletic meet	145 40
National Association dues	10 00
Baseball	701 40
Grand stand charges	116 89
Bands (proportioned)	500 00
Speed premiums	8,495 99
Speed judges	71 96
Superintendent of speed (Iman)	40 00
Superintendent amphitheatre	22 20
Clerk of speed (Dickman)	41 50
Starter (McCreary)	125 00
Ticket sellers	80 00
Gate-keepers	80 00
Police on track and grand stand	278 00
Printing	76 25
Postage	81 00
Damage account collision	140 00
Labor on race track	87 92
Flagman	7 50
Total	$12,200 56
Total receipts	11,224 90
Deficit	$975 66

SECRETARY'S OFFICE.

With our fair assuming greater proportions each year, we find the work in all the departments increasing. This has been very noticeable in the secretary's office, from which during the year, has issued more than 20,000 pieces of mail and 1,461 warrants. The handling of the speed, concessions, machinery, press and advertising departments from this office, in addition to the ordinary duties such as were handled before the removal of the office to Lincoln, has increased the work materially. The great amount of relocation and improvement on the grounds has caused an unusual amount of extra labor on the part of the resident members of the Board, and incidentally added to the work necessary to be performed by the office. The accumulation of 17,000 volumes of old reports have been turned back to us by the State Historical Society and we found among them were remaining as high as 2,700 for one year. We are sending these reports to the farmers' institutes for distribution, and have sent out about ten thousand to date, with expectations of increasing this to 18,000 or 20,000 before institute season ends.

NATIONAL MEETINGS.

At the semi-annual meeting this body elected O. P. Hendershot as delegate to the Shorthorn Breeders' Association, and Mr. Peter Youngers and your Secretary as delegates to the National Association of Fairs and Expositions, which meetings were held in Chicago the first week in December. All of your delegates attended each of the meetings, and Nebraska secured considerable recognition. This is the second year that this body has been represented by several of its members and we are satisfied it is the proper policy to ultimately secure recognition for our state.

We secured as dates for our coming fair the week commencing Monday, August 31, and ending Friday, September 4.

We would recommend that at the next Shorthorn breeders' meeting we introduce a resolution that said American Shorthorn Breeders' Association distribute the holding of its annual meeting at Hamline alternately between the state fairs at Hamline, Des Moines and Lincoln, thereby permitting us to have the benefit of this great show once within a stated period of years.

The money on hand and receipts of the 1907 fair are as follows:

January 17, 1907, balance on hand			$37,406 12
1907 Concessions		$9,027 45	
Speed		4,115 40	
Miscellaneous		449 61	
Interest		678 25	
State warrant		2,000 00	
Coupon tickets		8,422 25	
Stalls, horse	$332 00		
Stalls, cattle	543 00		
Pens, swine	699 00		
Pens, sheep	39 00	1,613 00	
Dray licenses		118 00	
Shorthorn special premiums		544 82	
Admission tickets		41,161 00	68,149 58
Total			$105,555 70
Warrants paid			79,463 91
Balance on hand at close of year 1907			$26,091 79

SUMMARY OF EXPENDITURES.

Advertising	$1,209 38
Attractions	5,977 79
Cleaning grounds	200 00
Carpenter work	2,829 50
Delegates to Chicago meetings	113 80
Excavating	1,649 40
Expenses of winter meeting	276 00
Fish building, labor	878 90
Freight, telegraph, express and drayage	140 76
Grading	6,739 52
Hotel bill	104 60
Hollenbeck, superintendent	446 50
Insurance	150 00
Labor pay-roll, other than itemized	4,640 77
Ladies' buildings, labor	278 32
Moving buildings	1,310 37
Material	9,446 36
Miscellaneous	2,411 42
Officers and salaries	4,940 38
Printing and postage	1,010 66
Premiums, other than speed	13,736 46
Plans and specifications	339 86
Painting and glass	2,749 23
Plumbing	794 79
Pipe	1,218 10
Railroad fare	162 45
Repairs on office	174 45
Ribbons for premiums	128 45
Speed	8,520 99
Superintendents, judges, clerks, etc	5,564 12
Teaming	1,320 58
Total	$79,463 91

CLASS "A"—HORSES.

LOT		Number of Entries	Number of Foreign Entries	Amount Premiums Offered.	Amount Premiums Paid
1	Percherons and French Draft...	89	None	$352.00	$304.00
2	Clydes and Shires..............	25	None	352.00	165.00
3	Belgians	34	None	352.00	173.00
4	English, French, and German Coach Horses.	11	None	352.00	60.50
5	Grade Draft, Percheron, French Draft, Belgian, Clydesdale, and English Shire	....	....	....	....
6	Registered Trotting.............	15	None	352.00	128.50
7	Ponies under 12 hands high......	47	None	99.50	86.50
8	Driving Horses	22	None	105.00	105.00
10	Grade Draft Teams..............	1	None	120.00	12.50
11	Saddle Horses.................	8	None	29.00	29.00
12	Asses	8	None	90.00	54.00
13	Discretionary	3	....	....	....
14	Shetlands	2	.. ..	....	....
	Totals	267	None	$2203.50	$1118.00

CLASS "B"—CATTLE.

LOT		Number of Entries	Number of Foreign Entries	Amount Premiums Offered	Amount Premiums Paid	Amount Premiums Paid Foreign Exhibitors
1	Shorthorns	312	119	$1132.50	$1131.50	$281.00
2	Herefords	126	36	501.00	487.00	113.00
3	Aberdeen-Angus......	65	24	441.00	355.00	168.00
4	Aberdeen-Angus	34	18	200.00	112.00	77.00
5	Galloways............	71	.... .	441.00	349.00	....
6	Red Polled............	98	23	441.00	392.50	40.00
7	Polled Durham........	77	60	441.00	358.00	310.00
8	Fat Steers	11	....	80.00	80.00	....
9	Jerseys and Guernseys	67	....	318.00	312.00	....
10	Holsteins	43	....	318.00	212.50	....
11	Milch Cows	5	....	60.00	52.00	... .
12	Discretionary	1	....	....	....	....
13	Milch Shorthorns......	1	....	200.00	....	....
	Totals........	911	280	$4573.50	$3841.50	$989.00

CLASS "C"—SWINE.

LOT	Number of Entries	Number of Foreign Entries	Amount Premiums Offered	Amount Premiums Paid	Amount Premiums Paid Foreign Exhibitors
1 Poland-China	533	64	$354.00	$354.00	$25.00
2 Berkshires	134	27	354.00	354.00	85.00
3 Duroc-Jersey Red	669	52	354.00	354.00	36.00
4 Chester Whites	167	65	354.00	354.00	147.00
Totals	1503	208	$1416.00	$1416.00	$293.00

CLASS "D"—SHEEP.

LOT	Number of Entries	Number of Foreign Entries	Amount Premiums Offered	Amount Premiums Paid	Amount Premiums Paid Foreign Exhibitors
1 Cotswolds	44	43	$140.00	$140.00	$132.00
2 Leicesters	18		135.00	46.00	
3 Lincolns	9	9	140.00	28.00	28.00
4 Hampshires	26		163.00	132.00	
5 Oxfords	43	32	185.00	140 00	
6 Shropshires	26		165.00	140.00	
7 Southdowns	20		140.00	132.00	
8 Rambouillets	16		135.00	62.00	
9 Discretionary	1				
Totals	203	84	$1203.00	$820.00	$160.00

CLASS "E"—POULTRY.

LOT	Number of Entries	Amount Premiums Offered	Amount Premiums Paid
1 Chickens	925	$1479.50	$753.12
2 Chickens	9	35.00	
3 Turkeys	4	47 75	13.50
4 Geese	158	70 00	52.99
6 Pigeons	60	48 00	14.75
6 Rabbits	8	9 00	1.88
7 Belgian Hares	3	6 00	.25
8 Discretionary	86		
Totals	1253	$1695.25	$836.49

CLASS "F"—FARM PRODUCTS.

LOT	Number of Entries	Amount Premiums Offered	Amount Premiums Paid
1 Threshed Grain	366	$99.00	$92.50
2 Grass Seeds	155	58 00	58.00
3 Mature Corn	324	60.50	55.50
4 Corn	655	60.50	59.50
5 Sheaf Display	167	102.00	98.00
6 Stalk Display	408	30.00	30.00
7 Vegetables	407	84 00	76.00
8 Vine Products	202	33.00	33.00
9 Discretionary	61	3.00	3.00
Total	2645	$530.00	$505.50

CLASS "G"—TEXTILES

LOT	Number of Entries	Number of Foreign Entries	Amount Premiums Offered	Amount Premiums Paid	Amount Premiums Paid Foreign Exhibitors
1 Household Fabrics and Quilts	61	....	$46.50	$42.00	....
2 Knitting—Silk, wool and cotton	76	....	44.00	25.50	....
3 Crocheting—Silk, wool and cotton	79	....	42.50	35 00	....
4 Sewing and Handwork	127	1	71.00	59.00	....
5 Drawn Work	98	....	41.00	33.00	....
6 Satin Stitch and English Eyelet Embroidery	82	....	44.00	38.00	....
7 Battenburg Lace Work	93	....	42.00	42.00	....
8 Outline Embroidery	29	....	17.00	10.50	....
9 Kensington Embroidery	90	....	30.50	25.00	....
10 Mount Mellick Embroidery	20	....	18.00	10.00	....
11 Hardanger and Cut Work	46	....	26.00	21.00	....
12 Embroidery of any material not otherwise specified or entered	101	....	49.00	38.00	....
13 Lace Work	60	....	43.00	43.00	....
14 Tatting and Netted Lace Work	50	....	30.00	27.00	....
15 Old Ladies' Department	135	3	92.00	80.00	$1.50
16 Bulgarian Work	6	....	11.00	8.00	....
17 Girls Department	66	....	42.00	29.00	....
18 Shadow Embroidery	35	....	9.75	9.75	....
19 Discretionary	58	....	....	....	....
Totals	1312	4	$698.75	$576.75	$1.50

CLASS "H"—FINE ARTS

LOT		Number of Entries	Amount Premiums Offered	Amount Premiums Paid
1	Oil Paintings	88	$233.75	$69.75
2	Oil Paintings	85	117.45	23.87
3	Juvenile List	37	24.75	4.75
4	China Painting or Ceramics	78	124.75	44.75
5	China Painting or Ceramics	163	71.20	43.39
6	Photography	65	16.20	11.70
7	Wood Carving	....	45.75	....
8	Pyrography	68	45.75	19.50
9	Raffia and Willow Baskets	28	13.50	12.00
10	Bead Work	25	22.50	13.50
11	Collective Exhibit of Public Schools	28	137.50	60.00
12	Discretionary	39	....	25.00
	Totals	704	$853.10	$328.21

CLASS "I"—DAIRY DEPARTMENT.

LOT		Number of Entries	Amount Premiums Offered	Amount Premiums Paid
1	Creamery Butter	1	$80.00	$2.50
2	Farm Butter	3	86.00	8.50
3	Ornamental Butter	1	20.00	6.00
4	Grand Sweepstakes	1	....	....
5	Factory Cheese	1	20.00	2.50
6	Farm and Dairy Cheese	2	15.00	8.00
7	Grand Sweepstakes	....	....	....
8	Bread and Cakes	164	60.00	48.25
9	Canned Fruits	123	22.50	21.00
10	Preserved Fruits	60	28.50	21.00
11	Jellies	75	15.00	12.75
12	Discretionary	14	....	....
	Totals	445	$347.00	$130.50

CLASS "J"—EDUCATIONAL.

LOT		Number of Entries	Amount Premiums Offered	Amount Premiums Paid
1	School Buildings and Grounds	12	$110.00	$110.00
2	Product Maps	....	12.00	3.00
3	Relief Maps	6	20.00	8.00
4	Manual Training	18	21.00	16.00
5	Home or School Gardening	8	24.00	10.00
6	School Gardens	3	45.00	15.00
7	Bread, Cake and Cookies	99	27.00	25.00
8	Canned Fruits	56	24.00	24.00
9	Jellies	34	12.00	18.00
10	Sewing and Hand Work	23	15.00	11.00
11	Collective	5	....	....
12	Maps	19	....	....
13	Penmanship	5	....	....
14	Class Work	5	....	....
15	Composition	....	....	....
16	Free Hand Drawing	39	....	....
17	Pen Drawing	18	7.00	7.00
18	Water Colors	53	9.00	9.00
19	Clay Modeling	....	....	....
20	Collection of Seeds, Grains, Grasses	3	3.00	....
21	General Collective Exhibits	17	50.00	50.00
22	Miscellaneous	26	....	....
	Totals	449	$376.00	$306.00

CLASS "K"—BEES AND HONEY.

LOT		Number of Entries	Amount Premiums Offered	Amount Premiums Paid
1	Bees and Honey	64	$156.00	$156.00
2	Honey Producing Plant	5	13.00	11.00
3	Discretionary	1	....	....
	Totals	70	$169.00	$167.00

CLASS "O"—COUNTY COLLECTIVE EXHIBITS.

COUNTY	REPRESENTATIVE	Points Scored	Amount Paid
EASTERN DISTRICT			
1 Washington	John H. Ballard	1155	$253.52
2 Douglas	J. W. Long	1139	200.35
3 Pawnee	A. Martin	996	162.02
4 Saline	Wm. Lowe	942	147.93
5 Nemaha	O. P. Dovel	876	130.70
6 Lancaster	C. N. Smalley	778	....
CENTRAL DISTRICT			
1 Kearney	R. W. Wait	1012	238.65
2 Red Willow	Stephen Bolles	854	147.51
3 York	M. B. Atkins	828	140.82
4 Franklin	W. H. Arnold	817	137.75
5 Webster	L. C. Peisiger	805	134.62
6 Howard	Z. T. Leftwick	743	117.44
7 Frontier	Loyal M. Graham	713	110.60
8 Antelope	F. M. Nichol	617	85.55
9 Furnas	C. E. Laverack	845	....
WESTERN DISTRICT			
1 Brown	A. McSweeney	617	197.45
2 Perkins	Wm. F. Edwards	456	105.49
3 Scotts' Bluffs	W. Clark	453	104.60
4 Keya Paha	L. A. Wilson	376	84.50
Totals		15022	$2499.50

CLASS "S"—SPEED.

LOT	Number of Entries	Amount Premiums Offered	Amount Premiums Paid	Number of Foreign Entries	Paid Foreign Exhibitors
1 Harness Races	195	$8900.00	$7180.49	66	$2974.50
2 Running Races	52	1650.00	1315.50	9	481.25
Totals	247	$10500.00	$8495.00	75	$3455.00

LIST OF WARRANTS ISSUED DURING YEAR OF 1907.

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
January					
24	E. Z. Russell............	1	Members—Exp. winter meeting, 1907		$270.00
24	Western Adv. Co........	2	Delegates' buttons ...		22.50
24	W. R. Mellor............	3	Post-office box rent...		1.00
24	W. W. Cole.............	4	Work for Revision Committee		3.00
24	J. B. Dinsmore..........	5	Expenses Shorthorn meeting		32.75
24	Peter Youngers, Jr......	6	Exp. Nat. Fair Ass'n.		32.75
24	E. Z. Russell............	7	Exch. on drafts, 1906.		2.74
24	Kostka Glass & Paint Co.	8	Glass, Fish and Game Building		3.75
24	Martin Towel Co.........	9	Towels, Oct., Nov., and Dec.		1.50
24	Globe Delivery Co.......	10	Drayage		.50
24	Brown & McLaughlin....	11	Bond of Sec'y & Treasurer		15.00
24	Benton Bros.............	12	Postage and printing.		101.50
31	S. McKelvie	13	Premium	$8.00	
February					
5	E. Z. Russell, Treas......	14	Reissue of No. 750, 782, 1178 and 1181.......	6.00	24.20
8	Globe Delivery Co.......	15	Freight & Drayage ...		19.79
8	G. W. Hervey...........	16	R. R. fare to Board meeting		3.30
8	O. P. Hendershot........	17	R. R. fare to Board meeting		4.78
8	Peter Youngers	18	R. R. fare to Board meeting		3.48
8	W. R. Mellor............	19	Salary for Jan........		166.65
8	Mary C. Fox............	20	Salary for Jan........		65.00
8	Charles Scully	21	Salary for Jan.......		16.66
8	W. R. Mellor............	22	Postage		13.20
8	Neb. Paper & Bag Co....	23	Paper and twine		4.83
8	J. W. Burleigh...........	24	Postage and printing..		7.50
14	W. K. Mitchell..........	25	Reissue No. 736 (1906)	2.50	
March					
1	Neb. Tel. Co............	26	Phone, Jan and Feb...		6.45
1	W. R. Mellor............	27	Salary for Feb........		166.65
1	Mary C. Fox............	28	Salary for Feb.......		65.00
1	Chas. Scully	29	Salary for Feb........		16.66

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
March					
1	G. W. Hervey	30	R. R. fare to Board meeting		3.30
1	O. P. Hendershot	31	R. R. fare to Board meeting		4.78
1	Lincoln Tel. Co.	32	Phone, Apr. to Dec. (inc.)		27.00
1	Geo. F. Dickman	33	R. R. fare to Board meeting		1.50
1	Globe Delivery Co.	34	Drayage and freight		10.49
1	Peter Youngers	35	R. R. fare to Board meeting		3.48
27	Benton Bros.	36	Postage and printing		79.50
April.					
5	Searle & Chapin Lbr. Co.	37	Lumber		26.88
5	Lincoln Tel. Co.	38	Phone, Jan., Feb. and Mar.		9.00
5	Harry Porter	39	Supplies		11.05
5	W. R. Mellor	40	Postage and R. R. fare		7.20
5	G. W. Hervey	41	R. R. fare		2.26
5	O. P. Hendershot	42	R. R. fare		2.26
5	Elijah Filley	43	R. R. fare and buggy hire		4.56
5	Neb. Tel. Co.	44	Phone for March		3.00
5	L. P. Ludden	45	Services		20.00
5	W. R. Mellor	46	Salary for March		166.65
5	Mary C. Fox	47	Salary for March		65.00
5	Chas. Scully	48	Salary for March		16.66
5	W. H. Knight, Sec'y Am. Trotting Ass'n	49	Docket fee The Habit		5.00
May					
1	Melicks Stables	50	Livery		8.50
1	Benton Bros.	51	Printing		5.00
1	W. R. Mellor	52	Salary		166.65
1	J. W. Burleigh	53	Printing		5.00
1	Chas. Scully	54	Salary for April		16.66
1	Mary C. Fox	55	Salary for April		65.00
1	Spirit of the West	56	Advertising races		15.00
1	Peter Youngers	57	R. R. fare		3.48
1	W. R. Mellor	58	Postage		10.68
1	Pacific Express Co.	59	Express		.50
1	Charles Downing, Sec'y	60	Annual dues, National Ass'n		10.00
1	Neb. Tel. Co.	61	Phone for April		3.00

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
May					
1	W. H. Knight, Sec'y......	62	Annual dues Trotting Ass'n		100.00
1	Western Union Tel. Co...	63	Telegrams		1.25
1	W. R. Bramblett & Co...	64	Cut of air-ship........		5.03
1	G. W. Hervey...........	65	R. R. fare		2.50
1	Elijah Filley	66	R. R. fare		3.84
1	O. P. Hendershot........	67	R. R. fare		3.22
6	Kastner & Billings......	68	Ret. entry fee, races..		5.00
6	W. R. Adams...........	69	Ret. entry fee, races..		5.00
6	K. C. Miller	70	Ret. entry fee, races..		5.00
6	Mrs. W. A. Lloyd.......	71	Ret. entry fee, races..		2.50
6	Phillips Bros.	72	Ret. entry fee races..		7.50
13	H. Hollenbeck	73	Labor acct. to May 1..		76.90
17	Western Union Tel. Co..	74	Telegrams		.55
17	The Western Horseman..	75	Advert. stake races...		24.90
17	The Horseman	76	Advert. stake races...		38.36
17	J. P. Wagner............	77	Ret. entry fee of "Roy Narva" 1906		20.00
17	Leon Crandall	78	Tornado Insurance ...		100.00
17	W. R. Mellor............	79	Postage and exp. fair grounds		14.00
17	Kostka Glass & Paint Co.	80	Paint		127.85
17	Neb. Tel. Co............	81	Phone to May 31......		9.60
17	E. Z. Russell	82	R. R. fare		2.80
17	E. Filley	83	R. R. fare		4.20
17	O. P. Hendershot	84	R. R. fare		3.22
17	G. W. Hervey	85	R. R. fare		2.20
	Void	86			
17	Globe Delivery Co.......	87	Drayage		1.14
17	H. Hollenbeck	88	Labor acct. to May 18.		275.92
27	Peter Youngers	89	Reissue R. R. fare(86)		2.52
28	H. Hollenbeck	90	Labor acct., May 25...		472.05
June					
6	H. Hollenbeck	91	Labor acct., June 1....		549.65
7	W. R. Mellor	92	Salary for May.......		166.65
7	Mary C. Fox............	93	Salary for May.......		65.00
7	Chas. Scully	94	Salary for May.......		16.66
7	Harry Porter	95	Supplies		4.60
7	J. W. Burleigh	96	Printing		1.50
7	Kostka Glass & Paint Co.	97	Paint brushes, etc.....		9.90
7	Benton Bros.	98	Printing		31.50
7	W. R. Mellor	99	Postage		50.00
7	Peter Youngers	100	R. R. fare		2.52

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
June					
7	G. W. Hervey	101	R. R. fare		2.20
7	E. Filley	102	R. R. fare		4.20
7	O. P. Hendershot	103	R. R. fare		3.22
12	Jim Younge	104	Ret. entry fee "The Picket"		5.00
12	H. Hollenbeck	105	Labor acct., June 8		419.68
18	H. Hollenbeck	106	Labor acct., June 15		452.70
25	H. Hollenbeck	107	60 pcs. water main		366.00
25	H. Hollenbeck	108	Sewer pipe		257.60
25	H. Hollenbeck	109	Labor acct., June 22		538.90
25	Mary C. Fox	110	Salary for June		65.00
July					
2	Benton Bros.	111	Postage and printing		34.50
2	H. Hollenbeck	112	Labor acct., June 29		796.80
8	H. Hollenbeck	113	Labor acct., July 6		749.70
10	J. H. Craddock	114	Plans for Fish Bldg.		50.00
13	Neb. Tel. Co.	115	Phone, June and July		9.65
13	W. R. Mellor	116	Salary for June		166.65
13	Cornell Engraving Co.	117	Half-tones and cuts		107.03
13	Watson, Woods Bros. & Kelley Co.	118	Refund on barn rent		13.33
13	Lincoln Sign Works	119	State house		9.00
13	Chas. Scully	120	Salary for June		16.66
13	Jacob North & Co.	121	Entry books		58.50
13	W. R. Mellor	122	Drayage and Express		2.14
13	Kostka Glass & Paint Co.	123	Paint, etc.		486.85
13	O. P. Hendershot	124	R. R. fare		3.42
13	Peter Youngers	125	R. R. fare		2.52
13	Elijah Filley	126	R. R. fare		4.20
13	G. W. Hervey	127	R. R. fare		2.20
15	H. Hollenbeck	128	Labor acct., July 13		1173.70
15	Thompson & Good	129	Part payment moving buildings		200.00
16	John Westover	130	Iron for Bldgs.		89.50
17	Long & Browitt	131	Iron pipe, water main		553.27
22	H. Hollenbeck	132	Labor acct., July 20		1135.85
22	L. W. Butler	133	Brick, Pub. Com. Bldgs.		43.75
26	O. P. Hendershot	134	R. R. fare		3.42
26	Elijah Filley	135	R. R. fare to Board Meeting		4.20
26	G. W. Hervey	136	R. R. fare		2.20
26	W. R. Mellor	137	Salary for June		166.65
26	Mary C. Fox	138	Salary for June		65.00
26	Chas. Scully	139	Salary for June		16.66

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
July					
26	Hall Bros. Co.	140	Hardware		8.35
26	W. R. Mellor	141	Express		1.30
26	Kostka Glass & Paint Co.	142	Paint, etc.		254.45
26	J. W. Burleigh	143	Printing		2.50
26	International Har. Co.	144	Mowing machine		46.00
26	Jacob North & Co.	145	Printing slips		2.50
26	Benton Bros.	146	Postage and printing.		52.25
26	Western Adv. Co.	147	Banners		76.00
27	Thompson & Good	148	Payment moving barns		200.00
30	H. Hollenbeck	149	Labor acct., July 27		1329.95
31	Table Rock Clay Co.	150	Brick (26,500)		188.15
31	Cooper & Cole Bros.	151	Pig lead, etc.		85.80
August					
6	H. Hollenbeck	152	Labor acct., Aug. 3		1510.70
9	Rees Printing Co.	153	Tickets (185-M)		46.25
9	Rudge & Guenzel Co.	154	Hardware		263.36
9	Cooper & Cole Bros.	155	Closets and hydrants.		881.63
9	Kostka Glass & Paint Co.	156	Paint, new bldgs.		129.85
9	Martin Towel Co.	157	Towel for office		1.50
9	Lindell Hotel	158	Bill of Board members		104.60
9	H. Hollenbeck	159	Supplies and blacksmith work		29.95
9	Lincoln Cornice & Metal Works	160	Gutter and conductor.		9.66
9	Nichols Roofing Co.	161	Gravel roof, Mercantile Hall		31.98
9	John Westover	162	Iron in Fisheries Bldg.		222.68
9	Searle & Chapin Lbr. Co.	163	Lumber and cement.		1599.25
9	Rudge & Guenzel Co.	164	Repairs on office		173.25
9	E. P. Weise	165	Putting in cement wk.		189.20
9	C. R. Smith & Co.	166	Lumber account		267.28
9	R. M. Phillips	167	100 loads of cinders		150.00
9	Adams Express Co.	168	Express		2.30
9	The Western Horseman	169	Advertising		29.00
9	Harry Porter	170	Supplies		1.85
9	J. W. Burleigh	171	Printing		3.00
9	Void	172			
9	Void	173			
9	Superior Color Press Co.	174	8 sheet posters		19.00
9	C. R. Smith & Co.	175	Lumber, June 25, July 19		1111.20
9	Wheeler Bros.	176	Lumber, June 26, July 17		1875.95

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
August					
9	Neb. Material Co.	177	Sandstone, lime, cement		668.61
9	Lincoln Paper Co.	178	Paper		2.52
9	American Express Co.	179	Express		3.45
9	Meade Plumbing Co.	180	Office water supply		48.25
9	United States Express Co	181	Express on color sheets		2.00
9	O. P. Hendershot	182	R. R. fare to Board meeting		3.42
9	Peter Youngers	183	R. R. fare to Board meeting		2.52
9	G. W. Hervey	184	R. R. fare to Board meeting		2.20
9	E. Filley	185	R. R. fare to Board meeting		4.20
9	L. W. Leonard	186	R. R. fare to Board meeting		3.00
12	H. Hollenbeck	187	Labor pay-roll, Aug. 10		1527.10
20	H. Hollenbeck	188	Labor pay-roll, Aug. 20		1773.70
21	Kostka Glass & Paint Co.	189	Paint and mortar color		85.00
21	Benton Bros.	190	Ribbon, postage and printing		317.45
21	Adams Express Co.	191	Express		15.97
21	J. S. Craig	192	Bill posting		2.24
21	G. W. Hervey	193	R. R. fare		2.85
21	Con Robinson	194	Bill posting		.96
21	Zehrung Bill Posting Co.	195	Bill posting		3.84
21	Lincoln Drug Co.	196	Corks		.90
21	Chas. Perky	197	Bill posting		1.44
21	C. P. Elam	198	Bill posting		1.68
21	J. F. Saup	199	Bill posting		1.68
21	J. H. Morton	200	Bill posting		2.56
21	W. R. Mellor	201	Telegram		.27
21	Void	202			
21	The Horse Review Co.	203	Advertising		39.39
21	Mrs. H. A. Sleeth	204	Assistant to Secretary		16.00
21	E. Z. Russell	205	R. R. fare to Board meeting		2.80
21	O. P. Hendershot	206	R. R. fare to Board meeting		3.42
21	Peter Youngers	207	R. R. fare to Board meeting		2.52
21	E. Filley	208	R. R. fare to Board meeting		4.20
21	Cooper & Cole Bros. Co.	209	Plumbing supplies		365.19
24	J. H. Craddock	210	Plans, live stock barn		289.86

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
August					
26	H. Hollenbeck	211	Labor pay-roll, Aug. 24		1541.85
30	J. C. Clark & Ed. Moore	212	Bill posting		5.00
30	Thompson & Good	213	Bal. moving barn		910.37
31	J. H. Ballard	214	Labor, Class "I"		2.00
31	Horace B. Wild	215	Advance payment, airship		50.00
31	E. C. Bishop	216	Educational exhibit appropriation		200.00
31	Mrs. M. B. Rose	217	Assistant to Secretary		13.74
September					
3	C. H. Rudge	218	Tickets redeemed		15.00
3	Frank Switzer, Sec'y	219	Tuesday ball game		146.85
3	Wm. Holmes	220	Grand stand		24.47
3	F. H. Scribner	221	Judging dairy cattle		35.00
3	Frank Switzer	222	Lincoln B. B. game, Wednesday		295.05
4	Wm. Holmes	223	Grand stand		49.17
4	Carl Thomas	224	Ticket seller		11.50
4	H. Hollenbeck	225	Pay-roll, Aug. 30		1151.35
5	Archer Brown	226	Refund switch. charge		4.00
5	Wm. Foster	227	Labor on fair ground		72.25
5	Frank Switzer, Sec'y	228	Baseball game, Thursday		259.50
5	Frank Switzer, Sec'y	229	Ticket refund		1.50
5	Wm. Holmes	230	Grand stand		43.25
5	T. J. Vanderhoof	231	Ticket seller		12.00
5	Chas. Grau	232	Judge county col. exh.		14.20
5	A. T. Shattuck	233	Judge Class "C"		42.00
5	C. H. Rhodes	234	Judge Class "E"		50.00
5	Mrs. C. E. Welton	235	Judge Class "I," Aug. 14		8.28
5	C. E. Fritzlen	236	Refund on cigar priv.		80.00
5	John Huston	237	Judge Class "A"		59.28
5	Horace B. Wild	238	Air-ship		500.00
5	E. A. Burnett	239	Judge swine		30.00
5	Mo. Pac. R. R. Co	240	Switching charge		4.00
5	Jas. T. Bradley	241	Bill posting		.80
5	C. C. Keyt	242	Switching charges		2.00
6	George Dorsch	243	Switching charges		2.00
6	Columbus Bill Post. Co.	244	Bill posting		1.68
6	Zehrung Bill Post. Co.	245	Bill posting		6.00
6	J. H. Seid	246	Reissue 602, series '06	$2.00	
6	George Allen	247	Switching		4.00
6	William Allen	248	Switching		4.00

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
September					
9	T. J. Vanderhoof........	249	Ticket seller		2.00
6	Benton Bros.	250	Printing		78.83
6	T. H. McGahey	251	Cleaning carpet		9.30
6	Harry Porter	252	Supplies		13.55
6	S. S. Matlock............	253	Bill posting..........		1.28
6	Mulvahills Bill Post. Co.	254	Bill posting..........		7.68
6	C. J. Baganstas.........	255	Labor, Board of Mgrs.		4.00
6	W. R. Mellor............	256	Postage, exp., car fare		7.60
6	Peter Youngers	257	Cash paid ex. items..		12.30
6	Nebraska Farmer	258	Advertising		35.00
6	The Daily Drover's Jour..	259	Advertising		25.00
6	Red Wing Adv. Co......	260	Horse covers..........		250.00
6	The Bee Pub. Co........	261	Advertising		50.40
6	Lincoln Daily Star......	262	Advertising		75.00
6	Forrest Frishette	263	Asst. Supt. Class "I"..		10.80
6	Mrs. I. Frishette.........	264	Asst. Supt. Class "I"..		25.00
6	Chas. Mann	265	Supt. Class "Q"......		42.25
6	Vincent Arnold	266	Supt. Class "I," lot 1-7		28.50
6	W. C. Caley..............	267	Supt. Class "K"......		32.00
6	Paul J. Lewelling........	268	Asst. Supt. Class "E"		24.35
6	John Blaine	269	Asst. Supt. Class "C"		28.34
6	George Leonard	270	2d Asst. Class "C"...		21.34
6	L. W. Leonard...........	271	Supt. Class "C"......		73.91
6	C. M. Lewelling..........	272	Supt. Class "E"......		49.95
6	E. M. Searle, Jr..........	273	Supt. Gates, pay-roll..		300.00
6	Martin Nelson	274	Judging Class "O"....		15.00
6	G. H. Moore, Supply Co..	275	Disinfecting		10.00
6	Val. Keyser	276	Judge Class "O"......		15.00
6	Marriner Electrical Co...	277	Installing account....		6.05
6	Chas. Scully & Jno. Scully	278	Labor on race track...		25.00
6	E. C. Kennedy...........	279	"Surena"		250.00
6	The World Pub. Co.......	280	Advertising		47.04
6	Neb. Paper & Bag Co....	281	Book paper		1.30
	Void	282			
6	Mrs. H. M. Brock	283	Judge Class "H"......		10.50
6	E. M. Little..............	284	Judge Dairy Test.....		25.00
6	Mrs. F. M. Hall..........	285	Supt. Class "H"......		30.00
6	Jos. Roberts	286	Supt. Mercantile Hall.		27.10
6	J. A. Caley	287	Express		3.35
6	Hiram Filley	288	Asst. Supt. Class "B".		25.20
6	Mrs. T. B. Rafter	289	Judge Class "G"......		18.60
6	Thos. Mortimer	290	Judge Class "B"......		50.00
6	Stewart McMasters	291	Postmaster		17.60
6	C. H. Rudge	292	Tickets Redeemed.....		8.95

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
September					
6	Fay J. Knott	293	Asst. Supt. Class "A"		24.56
6	J. A. Ollis, Jr.	294	Asst. Supt. Class "A"		48.56
6	Mrs. M. W. Morley	295	Asst. Supt. Class "H"		16.00
6	A. Walworth	296	Watchman, Art Hall		25.50
6	Harry Keyser	297	Clerk to Secretary		27.00
6	Ruby Charlton	298	Clerk to Secretary		30.00
6	Ola B. Hervey	299	Clerk to Secretary		35.20
6	Ralph Hendershot	300	Clerk to Secretary		27.60
3	C. P. Delier	301	Speed	$50.00	
3	J. T. Wright	302	Speed	100.00	
3	W. R. Adams	303	Speed	225.00	
3	Robert Spencer	304	Speed	25.00	
3	Frank Strahan	305	Speed	100.00	
3	Frank Strahan	306	Speed	100.00	
3	E. C. Kennedy	307	Speed	100.00	
4	B. F. Swaggard	308	Speed	25.00	
4	Frank Daily	309	Speed	50.00	
4	Geo. H. Campbell	310	Speed	50.00	
4	Geo. H. Campbell	311	Speed	162.50	
6	J. H. Creasman	312	Speed	15.00	
	Void	313			
5	J. H. Shire	314	Speed	200.00	
5	B. J. Yankey	315	Speed	100.00	
5	J. K. Strohm	316	Speed	225.00	
5	D. B. Gunn	317	Speed	50.00	
5	D. B. Gunn	318	Speed	225.00	
5	Peter Delier	319	Refund, Suspension		22.00
5	W. O. Southwick	320	Speed	200.00	
5	Joe Riordan	321	Refund ½ ent. fee		12.50
5	N. J. Ronin	322	Speed	100.00	
5	N. J. Ronin	323	Speed	225.00	
5	C. H. Aldrich	324	Speed	450.00	
5	Fred Douglas	325	Speed	450.00	
5	A. F. Dehart	326	Speed	12.50	
5	I. E. Ault	327	Speed	55.00	
5	Wm. Zulauf	328	Speed	50.00	
5	Jos. McGuire	329	Speed	25.00	
5	Edw. Pyle	330	Speed	50.00	
5	Wm. K. Slade	331	Speed	50.00	
5	James Hand	332	Speed	20.00	
5	C. A. Keryns	333	Speed	225.00	
5	G. Hulshizer	334	Speed	25.00	
5	W. O. Southwick	335	Speed	450.00	
5	W. G. Mercer	336	Speed	15.00	

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
September					
6	W. G. Mercer	337	Speed	15.00	
6	C. Pickerel	338	Speed	55.00	
6	C. Pickerel	339	Speed	41.25	
6	C. Pickerel	340	Speed	15.00	
6	L. H. North	341	Speed	200.00	
6	Geo. H. Campbell	342	Speed	100.00	
6	W. D. Boyd	343	Speed	100.00	
6	O. Hall	344	Speed	7.50	
6	O. Hall	345	Speed	41.25	
6	O. Hall	346	Speed	20.00	
6	C. H. Samson	347	Speed	25.00	
6	C. H. Samson	348	Speed	25.00	
6	W. H. Plourd	349	Speed	82.50	
6	W. H. Plourd	350	Speed	100.00	
6	H. Shields	351	Speed	15.00	
6	H. Shields	352	Speed	7.50	
6	H. Shields	353	Speed	10.00	
6	H. Shields	354	Speed	7.50	
6	H. Shields	355	Speed	10.00	
6	Chas. McNabb	356	Speed	275.00	
6	Chas. McNabb	357	Speed	30.00	
6	L. P. Southworth	358	Speed	50.00	
6	L. P. Southworth	359	Refund ½ ent. fee		12.50
6	W. R. Peel	360	Refund ½ ent. fee		12.50
6	Wm. Jefferis	361	Refund ½ ent. fee		25.00
6	C. H. Samson	362	Refund ½ ent. fee		12.50
6	C. H. Samson	363	Refund ½ ent. fee		25.00
6	C. D. Bell	364	Speed	100.00	
6	C. D. Bell	365	Speed	50.00	
6	C. D. Bell	366	Refund ½ ent. fee		25.00
6	R. D. Wall	367	Refund ½ ent. fee		15.00
6	E. C. Kennedy	368	Speed	225.00	
6	Void	369			
6	E. J. Brown	370	Refund ½ ent. fee		15.00
6	Walter S. Miller	371	Speed	225.00	
6	Walter S. Miller	372	Speed	100.00	
6	John Neylon	373	Refund ½ ent. fee		12.50
6	Mrs. W. A. Lloyd	374	Speed	50.00	
6	C. Johnson	375	Speed	225.00	
6	B. F. Morehouse	376	Speed	112.50	
6	Wray Bros.	377	Speed	100.00	
6	C. H. Samson	378	Speed	25.00	
6	John Povey	379	Speed	50.00	
6	P. Frederick, Jr.	380	Speed	50.00	

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
September					
6	C. P. Johnson	381	Speed	450.00	
6	A. Liberati	382	Band		2000.00
6	A. Meese	383	Refund ½ ent. fee		15.00
6	A. Meese	384	Refund ½ ent. fee		12.50
6	Wm. Jackson	385	Speed	100.00	
6	R. D. Wall	386	Refund ½ ent. fee		15.00
6	I. E. Ault	387	Speed premium	41.75	
6	H. Shields	388	Speed premium	7.50	
6	R. D. Conry	389	Speed premium	50.00	
6	W. J. Conly	390	Refund ½ ent. fee		25.00
6	J. W. House	391	Refund ½ ent. fee		12.50
6	Geo. C. Anderson	392	Speed	225.00	
6	Geo. C. Anderson	393	Speed	25.00	
6	J. H. Iseman	394	Refund ½ ent. fee		15.00
6	Jas. McGowan	395	Speed	200.00	
6	Jas. McGowan	396	Speed	50.00	
6	C. S. Lucas	397	Speed	100.00	
6	O. Hall	398	Speed	15.00	
6	O. Thompson	399	Speed	50.00	
6	C. J. Douglas	400	Speed	41.25	
6	Robert Taylor	401	Premiums	104.00	
6	Robert Taylor	402	Premiums	18.00	
6	C. C. Beers	403	Premiums	10.00	
6	Robert Taylor	404	Premiums	106.00	
6	Robert Taylor	405	Premiums	18.00	
6	Geo. Allen	406	Premiums	72.00	
6	Wm. Allen	407	Premiums	68.00	
6	Geo. Allen	408	Premiums	74.00	
6	Robt. Taylor	409	Premiums	51.00	
6	Wm. Allen	410	Premiums	58.00	
6	Lewis Bros.	411	Premiums	50.00	
6	F. H. Coriell	412	Premiums	82.00	
6	D. C. Lewis	413	Premiums	56.00	
6	W. W. Waltmire	414	Premiums	42.00	
6	Wm. Foster	415	Premiums	16.00	
6	F. H. Coriell	416	Premiums	82.00	
6	Gilbert Van Patten	417	Premiums	48.00	
6	M. S. Moats & Son	418	Premiums	8.00	
6	E. K. Young & Son	419	Premiums	3.00	
6	S. P. Briggs	420	Premiums	2.00	
6	John Delaney	421	Premiums	4.00	
6	E. Z. Russell	422	Premiums	10.00	
6	Sam'l W. Hogate	423	Premiums	2.00	
6	Geo. Briggs & Son	424	Premiums	45.00	

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
September					
6	H. B. Louden & Sons	425	Premiums	19.00	
6	J. O. Hunt	426	Premiums	8.00	
6	Manley & Co	427	Premiums	25.00	
6	J. B. Manley	428	Premiums	16.00	
6	Kirkpatrick & Wilson	429	Premiums	3.00	
6	W. M. Putnam	430	Premiums	7.00	
6	Chas. Van Patten	431	Premiums	6.00	
6	Sam Stewart & Sons	432	Premiums	26.00	
6	W. H. Taylor	433	Premiums	5.00	
6	Clarence Beavers	434	Premiums	7.00	
6	F. H. Whittrock	435	Premiums	1.00	
6	R. J. Harding	436	Premiums	6.00	
6	W. P. Townsley	437	Premiums	3.00	
6	C. W. Buck	438	Premiums	6.00	
6	Robert Pritchard	439	Premiums	17.00	
6	J. E. Mendenhall	440	Premiums	4.00	
6	Smith Brown	441	Premiums	6.00	
6	Wm. Retzleff	442	Premiums	2.00	
6	J. W. Reid	443	Premiums	2.00	
6	J. A. Ollis, Jr.	444	Premiums	3.00	
6	O. E. Osborne	445	Premiums	13.00	
6	V. A. Briggs	446	Premiums	5.00	
6	Ezra F. Sohl	447	Premiums	3.00	
6	Roberts & Harter	448	Premiums	6.00	
6	W. F. Waldo	449	Premiums	19.00	
6	J. Stroh	450	Premiums	1.00	
6	Henry G. Warren	451	Premiums	11.00	
6	J. J. Sargent	452	Premiums	2.00	
6	Vanderslice Bros.	453	Premiums	76.00	
6	R. F. Fantz	454	Premiums	25.00	
6	W. W. Waltmire	455	Premiums	56.00	
6	Humbert & White	456	Premiums	80.00	
6	H. L. Bode	457	Premiums	2.00	
6	Wm. Gilmore & Sons	458	Premiums	60.00	
6	Frank C. Tatro	459	Premiums	20.00	
6	John Cramer	460	Premiums	5.00	
6	Mrs. Clara E. Finch	461	Premiums	3.00	
6	Mrs. N. E. Holladay	462	Premiums	6.25	
6	Mrs. A. F. Voderberg	463	Premiums	.25	
6	Mrs. C. C. Dunbaugh	464	Premiums	1.75	
6	Mrs. Lorena B. Stratton	465	Premiums	5.25	
6	Mrs. A. E. Hildebrand	466	Premiums	2.75	
6	Mousel Bros.	467	Premiums	137.00	
6	E. R. Morgan	468	Premiums	27.00	

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
September					
6	J. G. Von Seggern........	465	Premiums	21.00	
6	W. N. Rogers...........	470	Premiums	162.00	
6	G. E. Darwin............	471	Premiums	3.00	
6	James E. Logan..........	473	Premiums	81.00	
6	E. W. Allen.............	472	Premiums	13.00	
6	Frank Davis	474	Premiums	69.00	
6	Chas. Graff	475	Premiums	75.00	
6	T. K. Tomson & Sons....	476	Premiums	150.00	
6	W. N. Rogers............	477	Premiums	20.00	
6	Geo. P. Schwab & Sons..	478	Premiums	79.50	
6	E. P. Wileman..........	479	Premiums	25.00	
6	Jas. E. Logan.............	480	Premiums	5.00	
6	S. M. McKelvie & Son...	481	Premiums	15.00	
6	Jas. Wilson & Sons......	482	Premiums	139.00	
6	Wm. Smiley	483	Premiums	90.00	
6	E. N. Allen.............	484	Premiums	5.00	
6	Void	485			
6	J. W. Armstrong........	486	Premiums	6.00	
6	Straub Bros.	487	Premiums	141.00	
6	E. R. Wileman..........	488	Premiums	15.00	
6	A. G. Abney............	489	Premiums	73.00	
6	G. W. Lindsey...........	490	Premiums	137.00	
6	Mrs. Barslow	491	Premiums	1.75	
6	Mrs. Emma Sprong......	492	Premiums	.50	
6	Mrs. H. C. Luckey.......	493	Premiums	5.50	
6	Agnes W. Abbott........	494	Premiums	4.25	
6	Mrs. Libbie Lundgren...	495	Premiums	1.00	
6	Mrs. Wm. J. Lynch......	496	Premiums	4.25	
6	Mrs. R. C. Adkins.......	497	Premiums	3.00	
6	Martha Witte	498	Premiums	3.00	
6	Mrs. E. Valentine.......	499	Premiums	5.25	
6	Mrs. Addie Jelsma......	500	Premiums	3.25	
6	Muirhead & Gordon.....	501	Premiums	35.00	
6	J. M. Neilson............	502	Premiums	16.00	
6	C. F. Cassady & Sons....	503	Premiums	69.00	
6	Jacob Cuatt.............	504	Premiums	21.00	
6	T. J. Congdon...........	505	Premiums	72.00	
6	F. A. Scherzinger.......	506	Premiums	34.00	
6	Honeywell & Reedy......	507	Premiums	15.00	
6	W. R. Holt.............	508	Premiums	45.00	
6	Dawson, Bakewell & McKeever	509	Premiums	36.00	
6	F. B. Barrett...........	510	Premiums	3.00	
6	Hill Bros.	511	Premiums	8.00	

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
September					
6	W. J. Hather	512	Premiums	28.00	
6	J. C. Meese	513	Premiums	38.00	
6	J. B. Simpkins	514	Premiums	9.00	
6	Dawson & Walker	515	Premiums	20.00	
6	J. W. Bakewell	516	Premiums	7.00	
6	L. W. Hamilton	517	Premiums	6.00	
6	W. L. McNutt	518	Premiums	15.00	
6	Chas. A. Lewis	519	Premiums	11.00	
6	J. L. Boner	520	Premiums	6.00	
6	D. C. Lonergan	521	Premiums	7.00	
6	H. C. Dawson & Sons	522	Premiums	56.00	
6	W. J. Bowman	523	Premiums	8.00	
6	Jos. Schmidt & Son	524	Premiums	10.00	
6	L. P. Fuller	525	Premiums	11.00	
6	E. C. Dart	526	Premiums	2.00	
6	Cavett Bros.	527	Premiums	22.00	
6	J. H. Hamilton & Sons	528	Premiums	17.00	
6	Fred Tanner	529	Premiums	5.00	
6	A. N. Wachter	530	Premiums	3.00	
6	R. D. Speltz	531	Premiums	4.00	
6	F. P. Briggs	532	Premiums	5.00	
6	Segrist & Stout	533	Premiums	3.00	
6	Sargent, Varney & Moore	534	Premiums	5.00	
6	J. H. Elerbeck	535	Premiums	5.00	
6	A. H. Bowman & Sons	536	Premiums	2.00	
6	H. C. McKelvie	537	Premiums	2.00	
6	H. L. Bode	538	Premiums	7.00	
6	Wm. Gilmore	539	Premiums	2.00	
6	George H. White	540	Premiums	16.00	
6	Chas. H. Mitchell	541	Premiums	8.00	
6	A. C. Shallenberger	542	Premiums	33.00	
6	A. C. Shallenberger	543	Premiums	85.00	
6	J. G. Brenizer	544	Premiums	14.00	
6	J. R. Mansfield & Son	545	Premiums	8.00	
6	G. H. Hasbrook	546	Premiums	31.00	
6	Howell Bros.	547	Premiums	10.00	
6	Robert Guthrie	548	Premiums	15.00	
6	Thos. Hunt	549	Premiums	2.00	
6	Geo. W. Stabler	550	Premiums	10.00	
6	Bellows Bros.	551	Premiums	117.00	
6	Thos. Andrews	552	Premiums	30.00	
6	Geo. F. Hart	553	Premiums	10.00	
6	A. F. Graves	554	Premiums	10.00	
6	Geo. Allen	555	Premiums	21.00	

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
September					
6	W. R. Holt	556	Premiums	5.00	
	Void	557			
6	Stephen Jelinek	558	Band at fair		500.00
6	C. J. Douglas	559	Premiums	15.00	
6	C. J. Douglas	560	Premiums	15.00	
6	John O'Kane	561	Premiums	3.00	
6	H. A. Gabby & Sons	563	Premiums	8.00	
6	John C. Doubt & Son	564	Premiums	196.00	
7	The Hospodar	565	Appropriation		25.00
9	H. A. Gabby	566	Premiums	78.00	
9	Hunter & Smith	567	Premiums	160.00	
9	H. C. Myers	568	Premiums	39.00	
9	Honeywell & Reedy	569	Premiums	92.00	
9	J. G. Von Seggern	570	Premiums	13.00	
9	Elliott R. Davis	571	Premiums	2.00	
9	Beatrice Creamery Co.	572	Premiums	12.50	
9	Honeywell & Reedy	573	Premiums	4.50	
9	Fred Hadler	574	Premiums	2.50	
9	Mrs. A. E. Waters	575	Premiums	3.00	
9	Christina Wittenbach	576	Premiums	5.00	
9	Mrs. Elizabeth N. Odell	577	Premiums	1.00	
9	Vine Wissbaum	578	Premiums	.50	
9	Aug. Segelke	579	Premiums	.50	
9	Bode Trough	580	Premiums	.50	
9	John McLeod	581	Premiums	1.50	
9	John Partch	582	Premiums	2.00	
9	Mrs. Gipple	583	Premiums	1.50	
9	J. R. Doane	584	Premiums	1.50	
9	Henry Smith	585	Premiums	1.50	
9	Fred Curtis	586	Premiums	1.50	
9	J. Hall	587	Premiums	.50	
9	Thos. Williams	588	Premiums	1.00	
9	John Murry	589	Premiums	.50	
9	W. Bates	590	Premiums	1.50	
9	O. P. Dovel	591	Premiums	28.25	
9	John H. Ballard	592	Premiums	39.50	
9	A. J. Martin	593	Premiums	6.00	
9	E. P. Harding	594	Premiums	2.00	
9	William Lowe	595	Premiums	14.25	
9	R. J. Orcutt	596	Premiums	1.00	
9	M. B. Atkins	597	Premiums	4.00	
9	Dutch Land Co.	598	Premiums	6.50	
9	T. B. Keedle	599	Premiums	29.50	
9	W. H. Arnold	600	Premiums	7.50	

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
September					
6	W. Clark	601	Premiums	104.60	
6	E. B. Trough	602	Premiums	238.65	
6	Steven Bolles	603	Premiums	147.51	
6	M. B. Atkins	604	Premiums	140.82	
6	W. H. Arnold	605	Premiums	137.75	
6	L. C. Peisiger	606	Premiums	134.62	
6	Z. T. Leftwich	607	Premiums	117.44	
6	L. M. Graham	608	Premiums	110.60	
6	F. M. Nichol	609	Premiums	85.55	
6	W. H. Peck	610	Premiums	197.45	
6	W. M. Stevens	611	Premiums	105.49	
6	Al. Wilson	612	Premiums	84.50	
6	J. H. Ballard	613	Premiums	253.52	
6	J. W. Shoemaker	614	Premiums	200.35	
6	Arnold Martin	615	Premiums	162.02	
6	Wm. Lowe	616	Premiums	147.93	
6	O. P. Dovel	617	Premiums	130.70	
6	Martha Schrank 6	618	Premiums	.50	
6	J. F. Winters	619	Premiums	1.00	
6	Mrs. C. F. Bowman	620	Premiums	1.50	
6	Gertie Cotton	621	Premiums	1.25	
6	Mrs. J. R. Cochran	622	Premiums	.25	
6	Mrs. Mary Cooper	623	Premiums	3.75	
6	G. S. Christy	624	Premiums	.25	
6	Mrs. F. R. Slade	625	Premiums	.75	
6	Mrs. Rachel Anderson	626	Premiums	.50	
6	Josephine Polk	627	Premiums	.75	
6	Mrs. J. D. Slade	628	Premiums	2.75	
6	Wm. James	629	Supt. Agri. Hall		46.20
6	E. G. Montgomery	630	Judge Class "F"		12.00
6	John Davis	631	Clerk to Secretary		24.00
6	Wm. Foster	632	Supt. grounds		40.00
6	E. C. Bishop	633	Supt. Class "J"		25.00
6	L. E. Emerson	634	Supt. Transportation		50.00
6	Dr. A. T. Peters	635	Veterinarian		40.00
6	Jeanette Chipman	636	Clerk to Secretary		18.00
6	O. E. Mickey	637	Supt. Cattle		44.00
6	Wayne G. Cook	638	Clerk to Secretary		8.45
	Void	639			
	Void	640			
6	Cooper & Cole Bros	641	Plumbing supplies		130.12
6	R. M. Phillips	642	Cinders		75.00
6	Table Rock Clay Co.	643	Brick		72.00
6	C. M. Strader	644	Blacksmithing		22.65

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
September					
6	J. S. Iman	645	Supt. of Speed		40.00
6	W. P. McCreery	646	Starting judge		125.00
6	Void	647			
6	John Hadberg	648	Speed		22.96
6	H. R. Smith	649	Judge Class "B"		40.00
6	Jno. F. McArdle	650	Supt. Amphitheatre		22.20
6	George F. Dickman	651	Clerk Speed		40.00
6	S. E. Galloway	652	Asst. Supt. Gates		36.20
6	Mrs. D. Fairchild	653	Asst. Supt. Class "G"		16.00
6	Mrs. L. L. Mansfield	654	Supt. Class "G"		30.00
6	M. Harrison	655	Asst. Class "G"		18.00
6	R. M. Wolcott	656	Supt. Class "D"		34.20
6	H. Shields	657	Exh. Races		25.00
6	Dr. H. Pritchard	658	Judge		34.00
6	Chas. Scully	659	Bill Post. work		62.92
6	W. E. Ewing	660	Judge Class "O"		22.80
6	M. C. Fox	661	Salary for August		65.00
6	Alice R. Sleeth	662	Clerk to Secretary		41.20
6	W. R. Mellor	663	August salary		166.65
6	Camp Sign Co.	664	Signs, fair grounds		6.10
6	E. Lorraine Searle	665	Messenger		5.00
6	Milford Pugh	666	Judge Classes "D" and "K"		19.34
6	L. W. Butler	667	Brick		42.75
6	Lucy Woodard	668	Help, Class "G"		10.00
6	W. J. O'Brien	669	Fish Exhibit		300.00
6	W. D. Crist	670	Clerk Classes "F" and "O"		26.20
6	Short Bros	671	Hardware supplies		4.98
6	L. P. Ludden	672	Asst. to Secretary		70.00
6	E. Z. Russell	673	Treasurer, payroll		306.08
6	I. W. Haws	674	Supt. Class "M"		80.16
6	E. M. Searle, Jr.	675	Bal. pay-roll		71.62
6	W. M. Leonard	676	Damages to rig on race track		15.00
6	Daily News Pub. Co.	677	Appropriation		29.40
6	Rees Printing Co.	678	Tickets (concession)		4.25
6	G. D. Bennett	679	Judge speed		15.00
6	E. Z. Russell	680	Treasurer Board Agri.		200.00
6	Peter Youngers	681	President Board Agri.		300.00
6	Chas. Scully	682	Salary for August		16.66
6	C. C. Carlson	683	1st Asst. Treasurer		49.72
6	State Hort. Society	684	Horticulture Exhibit		800.00
6	D. L. Russell	685	Clerk to Secretary		13.50

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
September					
6	Peter Youngers	686	Secret service		42.48
6	C. H. Rudge	687	Chairman Board Mgrs.		200.00
6	H. L. Cook	688	Member Board Mgrs.		200.00
6	G. W. Hervey	689	Member Board Mgrs.		200.00
6	O. P. Hendershot	690	Member Board Mgrs.		200.00
6	Elijah Filley	691	Member Board Mgrs.		200.00
6	L. M. Downs	692	Clerk Class "B"		24.00
6	Horace B. Wild	693	Air-ship Flights		1350 00
6	William Foster	694	Supt. Force		575.00
6	I. J. Edwards	695	Dr. Tom exhibition		300.00
6	Twentieth Cent. Farmer.	696	Special advertising		40.00
6	Twentieth Cent. Farmer.	697	Appropriation		35.00
6	West. Newspaper Union.	698	Advertising		40.00
6	C. H. Rudge	699	Tickets redeemed		17.00
6	Svenska Farm Journalen	700	Appropriation		25.00
6	Trade Review	701	Appropriation		20.00
6	State Journal & News	702	Appropriation		150 00
6	E. E. Smith	703	Judge Class "F"		12.00
6	Lena Russell	704	Clerk to Secretary		18.20
7	U. F. Stanard	705	Clerk to President		29.44
7	E. M. Searle, Jr	706	Supt. Gates		40.00
7	J. D. Ream	707	Judge Class "O"		25.00
7	Void	708			
7	Lew Franklin	709	Exh. trained chickens		20.00
7	Geo. M. Pinneo	710	Athletic meet		164.50
7	Clark & Johnson	711	Concession help		263.00
7	E. H. Clark	712	Supt. concessions		60.00
7	A. J. Johnson	713	Supt. concessions		71.20
7	E. Z. Russell, Treasurer.	714	Pay-roll, police		1311.91
7	Hiram Myers	715	Clerk to concessions		38.50
7	Frank Davis	716	Premiums	12.00	
7	M. Yoakum & Son	717	Premiums	79.00	
7	W. R. Mellor	718	Policeman Kline		13.72
7	Lincoln Sash & Door Co.	719	Sawdust		13.50
7	Alice R. Sleeth	720	Clerk to Secretary		8.00
7	C. E. Haney	721	Unused tickets		1.50
9	E. Z. Russell	722	Incidentals		9.75
9	Rhea Bros.	723	Premiums	70.00	
9	Watson, Woods & Kelly.	724	Premiums	69.50	
9	Frank Iams	725	Premiums	198.50	
9	North, Robinson & Co.	726	Premiums	38.00	
9	N. S. Shannon	727	Refund ent. fee		15.00
9	N. S. Shannon	728	Refund ent. fee		15.00
9	W. T. Stantz	729	Refund ent. fee		12.50

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
September					
9	O. P. Hendershot	730	Premiums	109.00	
9	G. M. Clark	731	Premiums	10.00	
9	North & Robinson	732	Premiums	32.50	
9	Lin. Importing Horse Co.	733	Premiums	73.00	
9	Frank S. West	734	Premiums	39.00	
9	G. E. Williams	735	Premiums	20.00	
9	J. F. Wright	736	Premiums	15.00	
9	Frank Howard	737	Premiums	57.50	
9	Frank Iams	738	Premiums	33.00	
9	Peter Johnson	739	Premiums	48.50	
9	John Neylon	740	Premiums	25.00	
9	C. D. Bell	741	Premiums	10.00	
9	Diers Bros.	742	Premiums	45.00	
9	Spivey, Robb & Co.	743	Premiums	13.00	
9	J. N. Stradley	744	Premiums	24.50	
9	Ed Hughes	745	Premiums	5.00	
9	Geo. L. Gallagher	746	Premiums	10.00	
9	Russell Iman	747	Premiums	28.00	
9	J. H. Ball	748	Premiums	15.00	
9	Mousel Bros.	749	Premiums	20.00	
9	Chas. B. Gregory	750	Premiums	15.00	
9	Landy Clark	751	Premiums	10.00	
9	W. G. L. Taylor	752	Premiums	5.00	
9	M. L. Deal	753	Premiums	25.00	
9	Clark Land Co.	754	Premiums	6.50	
9	Grover Keedle	755	Premiums	9.00	
9	W. H. Peck	756	Premiums	1.50	
9	J. W. Long	757	Premiums	26.50	
9	Z. T. Leftwich	758	Premiums	1.00	
9	Henry Grau	759	Premiums	.50	
9	Arnold Martin	760	Premiums	51.75	
9	J. J. Cooper	761	Premiums	3.00	
9	L. C. Peisiger	762	Premiums	13.00	
9	W. C. Wollman	763	Premiums	.50	
9	D. D. Carherder	764	Premiums	1.00	
9	Larce Flarcher	765	Premiums	.50	
9	Geo. Dierks	766	Premiums	43.00	
9	Stephen Bolles	767	Premiums	4.00	
9	Don Anderson	768	Premiums	2.50	
9	Barry & Attins	769	Premiums	1.50	
9	Geo. H. Rose	770	Premiums	6.50	
9	W. E. Long	771	Premiums	6.00	
9	J. W. Shumaker	772	Premiums	11.50	
9	Henry Curry	773	Premiums	1.50	

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
September					
9	C. V. Shumaker	774	Premiums	5.00	
9	A. R. Dodson	775	Premiums	8.50	
9	Jas. Conry	776	Premiums	4.50	
9	Jno. Zwonechek	777	Premiums	2.50	
9	T. M. Nichol	778	Premiums	5.50	
9	Chas. Schwale	779	Premiums	7.00	
9	Lee Smith & Son	780	Premiums	11.50	
9	Henry Meier	781	Premiums	6.00	
9	F. Molton	782	Premiums	4.50	
9	F. J. Dodson	783	Premiums	3.00	
9	A. L. Toops	784	Premiums	11.50	
9	Henry Gelston	785	Premiums	2.00	
9	Lyman Uble	786	Premiums	6.00	
9	Stephen Hall	787	Premiums	1.00	
9	R. Hogue	788	Premiums	3.00	
9	J. H. James	789	Premiums	3.00	
9	W. K. Berder	790	Premiums	4.00	
9	G. W. Hummel	791	Premiums	10.50	
9	Harry Smith	792	Premiums	1.00	
9	Seth Abbott	793	Premiums	1.00	
9	J. Brier	794	Premiums	1.00	
9	Jacob V. Wolfe	795	Premiums	.50	
9	H. M. Gillaspey	796	Premiums	1.50	
9	John Smerjder	797	Premiums	1.00	
9	James Duffin	798	Premiums	1.50	
9	Lewis A. Wilson	799	Premiums	1.00	
9	John Hill	800	Premiums	1.00	
10	Emma Huber	801	Premiums	2.00	
10	Mrs. Eva Hunt	802	Premiums	1.00	
10	Mrs. G. L. Schralberger	803	Premiums	4.00	
10	Mrs. Mary Nodolf	804	Premiums	16.50	
10	Mrs. E. W. Hammond	805	Premiums	5.00	
10	Mrs. W. L. Garten	806	Premiums	1.50	
10	Mrs. A. M. Preist	807	Premiums	3.00	
10	Mrs. N. A. Linn	808	Premiums	1.50	
10	Mrs. C. W. Spears	809	Premiums	2.00	
10	Mrs. J. J. Carmichael	810	Premiums	4.00	
10	Mrs. J. M. Parkinson	811	Premiums	8.00	
10	Mrs. J. L. Wright	812	Premiums	5.00	
10	Mrs. H. B. Hohman	813	Premiums	3.00	
10	Mrs. W. L. West	814	Premiums	2.50	
10	Mrs. P. J. Lawrence	815	Premiums	1.50	
10	Mrs. C. S. Smith	816	Premiums	5.00	
10	Mrs. A. Pettit	817	Premiums	3.00	

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
September					
10	Mrs. A. Hegan	818	Premiums	6.00	
10	Barbara Ackerman	819	Premiums	1.00	
10	Mrs. Libbie Lundgren	820	Premiums	12.50	
10	Mrs. Mary E. Towle	821	Premiums	12.00	
10	Ella Doolittle	822	Premiums	3.00	
10	Mrs. J. D. Slade	823	Premiums	.50	
10	Mrs. Mary Cooper	824	Premiums	6.00	
10	Mrs. Pearl Reeve	825	Premiums	6.00	
10	Mrs. F. J. Nebuda	826	Premiums	4.50	
10	Irenna R. Lehman	827	Premiums	1.00	
10	Mrs. M. J. Cass	828	Premiums	1.50	
10	Sadie Sarbach	829	Premiums	10.00	
10	Mrs. Addie Williams	830	Premiums	1.00	
10	Mrs. H. E. Doolittle	831	Premiums	1.50	
10	Mrs. Jos. Siren	832	Premiums	1.00	
10	Miss Bertha W. Copp	833	Premiums	3.50	
10	Mrs. H. L. Schofield	834	Premiums	1.00	
10	Mrs. Chas. Wilson	835	Premiums	3.00	
10	Mrs. A. H. Randolph	836	Premiums	16.00	
10	Mrs. Jos. Bolshaw	837	Premiums	1.00	
10	Mrs. H. L. Marshall	838	Premiums	20.00	
10	Mrs. E. A. Valentine	839	Premiums	11.00	
10	Mrs. May C. Harris	840	Premiums	.50	
10	Mrs. A. J. Hartley	841	Premiums	1.50	
10	Mrs. R. O. Rocco	842	Premiums	3.00	
10	Mrs. Chas. Kaufman	843	Premiums	4.50	
10	Carrie Barstow	844	Premiums	4.00	
10	Mrs. John Kaufman	845	Premiums	1.50	
10	Mrs. May Hyder	846	Premiums	20.50	
10	Mrs. Kenyon	847	Premiums	8.50	
10	A. Lococo	848	Premiums	2.00	
10	Mrs. M. E. Elderdice	849	Premiums	1.00	
10	Mrs. S. R. Greer	850	Premiums	4.00	
10	Mrs. Ella C. Hammond	851	Premiums	7.00	
10	Mrs. E. McCarty	852	Premiums	3.50	
10	D. E. Pert	853	Premiums	4.00	
10	Mrs. J. Hudson	854	Premiums	1.50	
10	Mrs. Helen Brock	855	Premiums	2.00	
10	Mrs. Chas. P. Hamilton	856	Premiums	12.00	
10	Mrs. W. Brungard	857	Premiums	3.00	
10	Mrs. W. M. Neil	858	Premiums	1.00	
10	Bernice L. Weekly	859	Premiums	2.00	
10	Mrs. David Wittamuth	860	Premiums	7.50	
10	Mrs. W. A. Johnson	861	Premiums	1.00	

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
September					
10	Mrs. E. H. Bradley	862	Premiums	.50	
10	Harriet Davis	863	Premiums	6.50	
10	Miss Jennie Torz	864	Premiums	1.50	
10	Mrs. S. B. Weil	865	Premiums	1.00	
10	Miss Matilda Solomon	866	Premiums	10.00	
10	Mrs. W. H. Gallop	867	Premiums	12.00	
10	Mrs. Walter G. Rogers	868	Premiums	2.00	
10	Mrs. Emma Bennett	869	Premiums	3.50	
10	Mrs. F. A. Scherzinger	870	Premiums	1.00	
10	Mrs. L. F. M. Easterday	871	Premiums	1.00	
10	Mrs. M. Estelle Calmes	872	Premiums	2.00	
10	Void	873			
10	Mrs. G. O. Burns	874	Premiums	1.00	
10	Lois Burress	875	Premiums	9.00	
10	Mrs. Rose Bartlett	876	Premiums	2.00	
10	Mrs. Emma Schneider	877	Premiums	3.00	
10	Margaret Hallett	878	Premiums	2.00	
10	Mrs. Chapin	879	Premiums	5.00	
10	Miss Inez George	880	Premiums	1.00	
10	Mrs. F. D. Heald	881	Premiums	11.00	
10	Mrs. Lillie Fern	882	Premiums	5.00	
10	Lola Reeves	883	Premiums	1.75	
10	Mrs. F. J. Rehlaender	884	Premiums	2.00	
10	Alice D. Lauer	885	Premiums	2.00	
10	Mrs. Lydia L. Eckle	886	Premiums	3.00	
10	Edna Reimers	887	Premiums	2.00	
10	Mrs. Lee Huff	888	Premiums	6.00	
10	Mrs. E. G. Brady	889	Premiums	5.00	
10	M. J. O'Brien	890	Premiums	1.00	
10	Mrs. Louisa T. Solomon	891	Premiums	3.00	
10	Mrs. Chas. Kunkler	892	Premiums	11.00	
10	Miss Christina Peterson	893	Premiums	1.50	
10	Mrs. O. B. Macy	894	Premiums	3.00	
10	Miss Lottie Sharp	895	Premiums	10.00	
10	Est. Mrs. J. G. Burress	890	Premiums	1.00	
10	Mrs. Carolina M. Peterson	897	Premiums	.50	
10	Miss Ada DeNoon	898	Premiums	3.50	
10	Mrs. W. A. Woodson	899	Premiums	6.00	
10	Mrs. Nellie McCracken	900	Premiums	1.00	
10	Sam Gelston	901	Premiums	2.50	
10	Will Woodard	902	Premiums	.50	
10	A. P. Hays	903	Premiums	1.50	
10	J. W. Bliss	904	Premiums	.50	
10	Hans Sass	905	Premiums	1.00	

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
September					
10	Wm. Tonlis	906	Premiums	.50	
10	A. E. Hildebrand	907	Premiums	.50	
10	W. M. Stevens	908	Premiums	2.00	
10	Lewis Krick	909	Premiums	1.00	
10	D. D. Awtry	910	Premiums	.50	
10	A. L. Picken	911	Premiums	1.00	
10	Chas. Beerup	912	Premiums	1.50	
10	L. D. Clifton	913	Premiums	5.50	
10	Levi Wheeler	914	Premiums	.50	
10	James Frampton	915	Premiums	1.00	
10	P. McGuire	916	Premiums	1.50	
10	Ed. Krick	917	Premiums	4.00	
10	Elwyn Ames	918	Premiums	1.00	
10	C. B. Hain	919	Premiums	2.00	
10	Mads Anderson	920	Premiums	1.50	
10	Chas. Potter	921	Premiums	.50	
10	Frank Sedlacek	922	Premiums	1.00	
10	John Sazama	923	Premiums	1.00	
10	Nervine Cashline	924	Premiums	2.00	
10	Harwin Smith	925	Premiums	1.50	
10	A. W. Carmichael	926	Premiums	2.50	
10	Geo. Sass	927	Premiums	1.00	
10	Mrs. C. F. Patterson	928	Premiums	3.00	
10	Miss Mary Olive Heath	929	Premiums	1.00	
10	Mrs. Wilbur D. Camp	930	Premiums	3.00	
10	Mrs. J. A. Pickens	931	Premiums	1.00	
10	Mrs. R. W. Reynolds	932	Premiums	1.00	
10	Mrs. G. A. Pierce	933	Premiums	1.00	
10	Mrs. Robert McPherson	934	Premuims	4.00	
10	Julia G. Constancer	935	Premiums	2.00	
10	Fay Bonnell	936	Premiums	1.00	
10	Mrs. E. Perry	937	Premiums	2.00	
10	Mrs. Clyde Cocker	938	Premiums	2.00	
10	Mollie Enyeart	939	Premiums	1.00	
10	Miss Emma Thornton	940	Premiums	2.00	
10	Anna K. Husted	941	Premiums	10.50	
10	Mrs. Pearl Lang	942	Premiums	2.00	
10	Mrs. M. Snader	943	Premiums	5.00	
10	Mildred D. Naylor	944	Premiums	3.00	
10	Mrs. Kadis	945	Premiums	1.00	
10	Nancy Sherman	946	Premiums	2.00	
10	Mrs. J. S. Hedgecock	947	Premiums	2.00	
10	Mrs. E. M. Odell	948	Premiums	25.00	
10	Mrs. Allie Whitlive	949	Premiums	2.00	

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
September					
10	Rose Yont	950	Premiums	2.00	
10	Mrs. J. H. Creighton	951	Premiums	3.00	
10	Mrs. Foster Seacrest	952	Premiums	1.00	
10	Mrs. Julia Marshall	953	Premiums	1.00	
10	Hattie Woodworth	954	Premiums	2.00	
10	Mrs. C. D. Sanderson	955	Premiums	3.00	
10	Mrs. Knox	956	Premiums	4.50	
10	Mrs. Jennie G. Odell	957	Premiums	7.50	
10	Mrs. C. J. McLeod	958	Premiums	1.50	
10	Mrs. Mary Jane Wash	959	Premiums	1.50	
10	Mrs. W. P. Alysworth	960	Premiums	3.00	
10	Mrs. E. Pierson	961	Premiums	2.00	
10	Mrs. Geo. R. Wilson	962	Premiums	5.50	
10	Barbara Ackerman	963	Premiums	2.00	
10	Mrs. E. A. Fox	964	Premiums	1.50	
10	Mrs. Emma Trout	965	Premiums	3.00	
10	Mrs. J. E. Boyd	966	Premiums	.50	
10	Mrs. A. Jenkins	967	Premiums	1.50	
10	Mrs. Dorchen Golding	968	Premiums	7.00	
10	Mrs. S. A. Giberson	969	Premiums	.50	
10	Mrs. Cary Cabell	970	Premiums	1.50	
10	Eliza Dickenson	971	Premiums	2.00	
10	Mrs. M. K. Barton	972	Premiums	2.00	
10	Miss Mabel Beresford	973	Premiums	2.00	
10	Mrs. W. D. Camp	974	Premiums	5.75	
10	Rose Yont	975	Premiums	7.00	
10	Frances E. Duncombe	976	Premiums	.75	
10	Edith Hall	977	Premiums	1.60	
10	Mrs. E. W. Allen	978	Premiums	.85	
10	Miss Hazel Edleman	979	Premiums	3.75	
10	Minnie Davis	980	Premiums	22.50	
10	Miss Anna Badger	981	Premiums	35.00	
10	Elizabeth Dolan	982	Premiums	6.25	
10	Louise Mundy	983	Premiums	19.50	
10	Mrs. C. H. Rockwell	984	Premiums	1.50	
10	Mrs. S. Forbes	985	Premiums	1.00	
10	Mrs. L. W. Granger	986	Premiums	1.85	
10	Miss Grace Bedson	989	Premiums	.75	
10	Mildred Naylor	987	Premiums	2.25	
10	Mrs. L. W. Granger	988	Premiums	.75	
10	Florence Butler	990	Premiums	.50	
10	Marcia Stewart	991	Premiums	2.00	
10	Mrs. C. D. Perkins	992	Premiums	1.00	
10	Myra Warner	993	Premiums	13.50	

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
September					
10	Miss Creta Warner	994	Premiums	6.25	
10	Miss Louisa Mundy	995	Premiums	10.25	
10	Lily Yont	996	Premiums	9.50	
10	Wm. Roca	997	Premiums	2.00	
10	Lura M. Russell	998	Premiums	.50	
10	Mrs. E. N. Peterson	999	Premiums	.75	
10	Miss Edith Kruse	1000	Premiums	1.75	
10	Miss Grace Kruse	1001	Premiums	1.25	
10	A. C. Shallenberger	1002	Premiums	15.00	
12	Mousel Bros.	1003	Premiums	25.00	
12	Mary Lena Baker	1004	Premiums	1.75	
12	Lily Yont	1005	Premiums	1.38	
12	Mary Chapin	1006	Premiums	2.38	
12	Frank King	1007	Premiums	3.00	
12	Archer King	1008	Premiums	1.50	
12	Geo. A. Smith	1009	Premiums	1.80	
12	A. H. Dinsmore	1010	Premiums	.40	
12	Mrs. C. S. Smith	1011	Premiums	.80	
12	Sam King	1012	Premiums	.80	
12	Mrs. C. C. Dunbaugh	1013	Premiums	2.00	
12	Mrs. Bessie Kaar	1014	Premiums	1.00	
12	Mrs. H. B. Crews	1015	Premiums	2.00	
12	Nettie Shugart	1016	Premiums	1.50	
12	Mrs. B. G. Morrison	1017	Premiums	.50	
12	Lillie Holoday	1018	Premiums	1.00	
12	Miss Eyler	1019	Premiums	.50	
12	Mrs. Sarah Kaar	1020	Premiums	1.00	
12	Mrs. G. A. Pierce	1021	Premiums	.50	
12	Mrs. G. A. Pierce	1022	Premiums	2.00	
12	Ruth Sheldon	1023	Premiums	1.25	
12	Mrs. John Yont	1024	Premiums	2.00	
12	Mrs. O. C. Eaton	1025	Premiums	3.00	
12	Mrs. S. F. Harris	1026	Premiums	1.00	
12	Mrs. Mabel Cox	1027	Premuims	4.00	
12	Miss Voderberg	1028	Premiums	2.00	
12	Gladys Wiel	1029	Premiums	9.50	
12	Eunice Chapin	1030	Premiums	6.50	
12	Eugenia Frost	1031	Premiums	1.50	
12	Florence Mosher	1032	Premiums	.50	
12	Hazel Covey	1033	Premiums	1.00	
12	Elsie Vallers	1034	Premiums	2.00	
12	Mae Christian	1035	Premiums	1.00	
12	Olga Seidell	1036	Premiums	.50	
12	Esther Hanson	1037	Premiums	.50	

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
September					
12	Charlotte Ward	1038	Premiums	.50	
12	Cecelia Ward	1039	Premiums	1.00	
12	Florence Osthoff	1040	Premiums	1.50	
12	Mrs. C. C. Dunbaugh	1041	Premiums	2.00	
12	Leta Linn	1042	Premiums	1.00	
12	Alfreda Barstow	1043	Premiums	.75	
12	Elizabeth Bonnell	1044	Premiums	1.50	
12	Mrs. E. T. Leek	1045	Premiums	1.50	
12	Ada Ruth Kuhn	1046	Premiums	.75	
12	Mrs. H. L. Schofield	1047	Premiums	1.50	
12	Mrs. Maude B. Arnold	1048	Premiums	2.50	
12	Herman Neitzel	1049	Premiums	.50	
12	Emma Seacrest	1050	Premiums	1.00	
12	Herman Neitzel	1051	Premiums	.50	
12	Mrs. H. E. Doolittle	1052	Premiums	4.25	
12	Void	1053			
12	Mrs. Kate Fossler	1054	Premiums	3.00	
12	Emma Seacrest	1055	Premiums	4.50	
12	Mrs. Libbie Lundgren	1056	Premiums	4.50	
12	Miss Etta Yont	1057	Premiums	4.60	
12	Mrs. Foster Seacrest	1058	Premiums	1.25	
12	Miss B. W. Copp	1059	Premiums	1.00	
12	Miss Ruth Lahr	1060	Premiums	3.05	
12	Cora Wood	1061	Premiums	1.00	
12	Mrs. C. M. Crittenden	1062	Premiums	1.00	
12	Miss Alice Carling	1063	Premiums	1.00	
12	Miss Maude B. Arnold	1064	Premiums	1.25	
12	Miss Blanch Edmiston	1065	Premiums	3.75	
12	Nettie W. Shugart	1066	Premiums	20.75	
12	Walter Rogers	1067	Premiums	11.75	
12	Clara Parke Johnson	1068	Premiums	3.25	
12	Mrs. Chapin	1069	Premiums	2.50	
12	Lydia Weckbach	1070	Premiums	1.00	
12	Mrs. R. B. Emmett	1071	Premiums	2.50	
12	Mabel Louise Davies	1072	Premiums	2.75	
12	Mrs. C. H. Rockwell	1073	Premiums	1.00	
12	Mrs. Anna Burchardt	1074	Premiums	1.50	
12	Miss Harriet Pierce	1075	Premiums	5.00	
12	Gertrude Kincaide	1076	Premiums	5.60	
12	Miss Ethel Troyer	1077	Premiums	.88	
12	Miss Lu Granger	1078	Premiums	1.00	
12	Helen Hall	1079	Premiums	1.00	
12	Antoinette Peters	1080	Premiums	.50	
12	Esther L. Bennett	1081	Premiums	.50	

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
September					
12	Hazel Bell Johnson	1082	Premiums	1.00	
12	Erma L. Johnston	1083	Premiums	.75	
12	Dora May Carling	1084	Premiums	.75	
12	Mrs. Ella Hammond	1085	Premiums	1.25	
12	Mrs. Burritt	1086	Premiums	.75	
12	Marie Cannon	1087	Premiums	1.50	
12	Mrs. May Anderson	1088	Premiums	1.00	
12	Nettie M. Snyder	1089	Premiums	.50	
12	Mary Van Derbeck	1090	Premiums	1.50	
12	Mrs. J. Bolshaw	1091	Premiums	1.00	
12	Miss Rose Herrick	1092	Premiums	2.00	
12	Mrs. A. E. Butler	1093	Premiums	3.50	
12	Grace M. Bennett	1094	Premiums	.50	
12	Miss Rose Greenamyer	1095	Premiums	3.00	
12	Margaret Hallett	1096	Premiums	1.50	
12	Mrs. B. A. Kurtz	1097	Premiums	.50	
12	Mrs. H. H. Loughridge	1098	Premiums	1.00	
12	Elizabeth Mann	1099	Premiums	1.50	
12	Watkins & Narton	1100	Payment on cleaning fair grounds		100.00
13	Lucile Roane	1101	Premiums	1.00	
13	Miss Lu Granger	1102	Premiums	.50	
13	Gladys Wiel	1103	Premiums	1.50	
13	Mrs. Helen S. Bacon	1104	Premiums	2.25	
13	Mrs. Loring Roscoe	1105	Premiums	1.00	
13	Mrs. Clark Prindle	1106	Premiums	1.50	
13	Miss Ruth Lahr	1107	Premiums	3.00	
13	Mrs. W. Thomas	1108	Premiums	1.00	
13	Katie A. Stalter	1109	Premiums	2.00	
13	Mrs. A. Greenamyre	1110	Premiums	1.00	
13	Mrs. Kenyon	1111	Premiums	1.00	
13	Clara Watkins	1112	Premiums	1.50	
13	G. D. Cally	1113	Premiums	8.00	
13	Trester Supply Co.	1114	Premiums	44.00	
13	Roselawn Apiaries	1115	Premiums	41.00	
13	H. A. Whitcomb	1116	Premiums	21.00	
13	E. Whitcomb	1117	Premiums	11.00	
13	Hanah Whitcomb	1118	Premuims	4.00	
13	Nellie Whitcomb	1119	Premiums	7.00	
13	Lucile Miller	1120	Premiums	4.00	
13	Kenneth Wassung	1121	Premiums	1.00	
13	Brown Squab Plant	1122	Premiums	2.00	
13	Harry Birkett	1123	Premiums	.50	
13	Fay Garrison	1124	Premiums	6.00	

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
September					
13	Louis Seiffert	1125	Premiums	.75	
13	John Tefft	1126	Premiums	.75	
13	Void	1127			
13	Earl Wilson	1128	Premiums	.50	
13	Halley Fishwood	1129	Premiums	1.00	
13	Cecil Jennings	1130	Premiums	.25	
13	Void	1131			
13	Ed. H. Eggert	1132	Premiums	15.00	
13	Harry Birket	1133	Premiums	.25	
13	Fay Garrison	1134	Premiums	.25	
13	A. A. DeWitt	1135	Premiums	1.25	
13	C. W. Brehm	1136	Premiums	6.95	
13	Mrs. W. Kirkpatrick	1137	Premiums	2.87	
13	James Maher	1138	Premiums	4.50	
13	P. A. Brehm	1139	Premiums	2.00	
13	Mrs. J. H. Creighton	1140	Premiums	5.25	
13	E. E. Smith	1141	Premiums	14.49	
13	A. H. Smith	1142	Premiums	1.75	
13	L. W. Park	1143	Premiums	3.75	
13	Lawrence Wentz	1144	Premuims	4.00	
13	Kent Davis	1145	Premiums	2.00	
13	Ray Stryker	1146	Premiums	18.75	
13	Sam McCowan	1147	Premiums	1.00	
13	Byron J. Smith	1148	Premiums	.75	
13	V. Van Eman	1149	Premiums	1.75	
13	F. C. Kantz	1150	Premiums	4.00	
13	Peter Larson	1151	Premiums	12.00	
13	Edw. Stockfeldt	1152	Premiums	3.00	
13	Wm. B. Swisher	1153	Premiums	8.00	
13	J. S. Catterson	1154	Premiums	10.50	
13	Harris Poultry Co.	1155	Premiums	73.75	
13	Mrs. E. S. Jennings	1156	Premiums	3.50	
13	Moll Bros.	1157	Premiums	4.50	
13	W. R. Gaylord	1158	Premiums	.75	
13	Mrs. M. B. Gaylord	1159	Premiums	.50	
13	Albert Lemen	1160	Premiums	17.50	
13	Normie Wicklund	1161	Premiums	3.00	
13	Mr. L. McCandlass	1162	Premiums	2.75	
13	C. S. McCandlass	1163	Premiums	7.00	
13	Geo. Feuerstein	1164	Premiums	10.50	
13	Perry Strandberg	1165	Premiums	17.00	
13	F. A. Tipton	1166	Premiums	.50	
13	A. E. Wagner	1167	Premiums	1.00	
13	Harold Swan	1168	Premiums	1.75	

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
September					
13	J. E. Lundgren	1169	Premiums	9.75	
13	P. J. Schwab	1170	Premiums	4.50	
13	Mrs. J. Hensler	1171	Premiums	3.25	
13	R. G. White	1172	Premiums	7.00	
13	H. M. Stephens	1173	Premiums	7.50	
13	John Fulmer	1174	Premiums	15.00	
13	W. S. Houck	1175	Premiums	14.50	
13	Louis Osborn	1176	Premiums	11.00	
13	Mrs. F. E. Kuzina	1177	Premiums	1.50	
13	Mrs. W. N. Brungard	1178	Premiums	.25	
13	Mrs. M. Roosa	1179	Premiums	3.00	
13	D. B. Segg	1180	Premiums	3.00	
13	Sam Gregg	1181	Premiums	8.00	
13	Alva Wilson	1182	Premiums	7.50	
13	Ford Poultry Co	1183	Premiums	2.50	
13	Delbert Stone	1184	Premiums	7.00	
13	Agnes Abbott	1185	Premiums	1.50	
13	C. H. Green	1186	Premiums	5.00	
13	Geo. Pennington	1187	Premiums	10.00	
13	Ed. H. Eggert	1188	Premiums	57.75	
13	Geo. F. Burkett	1189	Premiums	3.50	
13	John Housel	1190	Premiums	15.00	
13	J. W. Alden	1191	Premiums	7.00	
13	Miss Krummack	1192	Premiums	2.50	
13	A. G. Cowles	1193	Premiums	.50	
13	M. G. Towle	1194	Premiums	3.00	
13	Mrs. C. E. Cowles	1195	Premiums	1.00	
13	H. H. Hall	1196	Premiums	18.50	
13	Clarence Kittinger	1197	Premiums	2.50	
13	O. R. Myers	1198	Premiums	26.75	
13	A. & M. C. Peters	1199	Premiums	5.50	
13	W. A. Melson	1200	Premiums	4.00	
13	Rudge & Guenzel	1201	Fire hose		$313.00
13	Melick's Stables	1202	Livery hire		70.00
13	W. H. Knight, Sec.	1203	Suspensions, coll		260.90
13	American Express Co.	1204	Express		5.03
13	U. P. R. R. Co.	1205	Switching		3.00
13	H. E. Bunting & Co.	1206	Plate glass		230.00
13	Korsmeyer & Co.	1207	Plumbing		18.97
13	Dr. J. M. Birkner	1208	Hospital corps		52.50
13	Dr. J. M. Birkner	1209	Services, Dr. in charge		20.00
13	Lincoln Sash & Door Co.	1210	Sawdust		5.25
13	Lincoln Ice & Cold Storage Co.	1211	Ice		115.40

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
September					
13	Neb. Telephone Co.	1212	Phone at fair		16.25
13	Watkins & Barton	1213	Balance cleaning grds.		100.00
13	Fay Garrison	1214	Premiums	.13	
13	E. F. Stewart	1215	Refund ent. fee		25.00
13	C. C. Stone	1216	Refund ent. fee		12.50
13	L. C. Kinney	1217	Refund ent. fee		25.00
13	Jos McGuire	1218	Refund ent. fee		15.00
13	Jas. Gillen	1219	Refund ent. fee		6.25
13	Michael Kelley	1220	Damage sustained by Tom Gibbons		125.00
13	C. R. Smith & Co.	1221	Lumber and plaster		521.55
13	F. H. Barton	1222	Pay-roll, Sept 14		27.60
13	H. Hollenbeck	1223	Pay-roll, Sept. 14		412.90
13	John Westover	1224	Bolts for aquariums		52.70
13	Searle & Chapin	1225	Lumber, windows and moldings		399.85
13	Cooper & Cole Bros.	1226	Plumbing supplies		114.36
13	Iowa Turf Pub. Co.	1227	Advertising		12.00
13	Nichols Roofing Co.	1228	Roofing		131.30
13	Neb. Telephone Co.	1229	Phones		8.00
13	Rudge & Guenzel Co.	1230	Hardware		385.29
13	S. C. Bassett	1231	Supt. Revision Com.		30.40
14	Wray Bros.	1232	Return ent. fee		25.00
14	C. R. Smith & Co.	1233	Lumber		139.80
30	Mrs. H. B. Crews	1234	Premiums	1.00	
30	Henry Vauck	1235	Premiums	1.00	
28	Paul Sieffert	1236	Reissue No. 663	.25	
28	Lester Eggert	1237	Premiums	40.00	
28	Myra Warner	1238	Premiums	1.00	
28	Creta Warner	1239	Premiums	4.00	
28	A. H. Smith	1240	Premiums	7.50	
14	Katie Wishman	1241	Premiums	1.00	
14	Lorena Johnson	1242	Premiums	1.00	
14	Life Sandy	1243	Premiums	1.00	
14	Aletha Bowman	1244	Premiums	2.00	
14	Rhoda Hickey	1245	Premiums	2.00	
14	Pink Sandy	1246	Premiums	5.00	
14	Verda Sanborn	1247	Premiums	4.00	
14	Gertrude Sanborn	1248	Premiums	3.00	
14	Nellie Adkins	1249	Premiums	1.00	
14	Eugene Bryant	1250	Premiums	1.50	
14	J. B. Archer	1251	Premiums	15.00	
14	Pfeiffer & Sherman	1252	Premiums	4.50	
14	Geo. Englehart	1253	Premiums	2.50	

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
September					
14	D. H. Young	1254	Premiums	3.00	
14	I. T. Brownson	1255	Premiums	3.00	
14	J. G. Gourlay	1256	Premiums	15.00	
14	G. W. Reynolds	1257	Premiums	2.00	
14	W. R. Chapline	1258	Premiums	3.25	
14	Seth Abbott	1259	Premiums	13.00	
14	Frank Miltenberger	1260	Premiums	14.25	
14	L. W. Park	1261	Premiums	6.00	
14	A. H. Smith	1262	Premiums	14.50	
14	H. C. Witte	1263	Premiums	10.00	
14	Peter Erickson	1264	Premiums	3.50	
14	E. M. Avery	1265	Premiums	63.00	
14	Supt. O. M. True	1266	Premiums	30.00	
14	Anna V. Day	1267	Premiums	20.00	
14	Supt A. E. Hildebrand	1268	Premiums	43.00	
14	P. O. Harris	1269	Premiums	10.00	
14	Stewart Marshall	1270	Premiums	1.00	
14	Supt. Margaret E. Brown	1271	Premiums	2.00	
14	Supt. Henry Vauck	1272	Premiums	34.00	
14	Hart Bowman	1273	Premiums	3.00	
14	Iraloo Abbott	1274	Premiums	1.00	
14	Verda Notion	1275	Premiums	2.00	
14	School Dist. No. 12	1276	Premiums	5.00	
14	Martho Schrank	1277	Premiums	1.00	
14	Frances Lynch	1278	Premiums	6.00	
14	Eunice Chapin	1279	Premiums	2.50	
14	Lucile Roane	1280	Premiums	1.00	
14	Edna May Brown	1281	Premiums	1.00	
14	Esther Abbott	1282	Premiums	1.00	
14	Miss Nellie Adkins	1283	Premiums	1.00	
14	Aletha Brown	1284	Premiums	1.50	
14	Agnes McKay	1285	Premiums	2.00	
14	Supt. Matzen	1286	Premiums	10.00	
14	Frances Lynch	1287	Premiums	9.00	
14	Hazel Stover	1288	Premiums	1.00	
14	Alberta Wynkoop	1289	Premiums	2.00	
14	Eileen Lynch	1290	Premiums	3.00	
14	Martha Schrank	1291	Premiums	2.00	
14	Eunice Chapin	1292	Premiums	1.00	
14	Void	1293			
14	Mary Chapin	1294	Premiums	1.00	
14	Leroy Langdon	1295	Premiums	1.00	
14	Edna May Brown	1296	Premiums	2.00	
14	Ona Huff	1297	Premiums	1.00	

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
September					
14	Esther Abbott	1298	Premiums	3.00	
14	Izolia Abbott	1299	Premiums	5.00	
14	Olive Loughridge	1300	Premiums	2.00	
October					
1	Alfalfa Meal Co	1301	Feed and forage		5.90
1	Globe Delivery Co	1302	Drayage and freight		4.85
1	Harry Porter	1303	Supplies		3.15
1	Pielstick & Haupt	1304	Refund concession		14.00
1	Lindell Hotel	1305	Washburn, order of Tracy, policeman		11.06
1	Jessie L. Troxel	1306	Asst. to Supt gates		1.25
1	Neb. Telephone Co	1307	Phone rental		15.00
1	Cone Distributing Co	1308	Bill posting		1.20
1	James Tyler	1309	Supplies and labor		52.90
1	James Tyler	1310	Water meter and labor		17.00
1	Cornell Engraving Co	1311	Ticket zinc etching		5.60
1	Beatrice Creamery Co	1312	Ice in refrigerator		28.60
1	Mary C. Fox	1313	½ month's salary		32.50
1	Louise Mundy	1314	Premium	1.50	
1	W. R. Mellor	1315	Salary for Sept		166.65
1	Donald Russell	1316	Clerk to Secretary		38.00
2	Benton Bros.	1317	Postage and printing		24.00
3	Alberta Wynkoop	1318	Premiums	3.00	
3	W. J. Armstrong	1319	Premiums	7.00	
5	H. Van Derbeck	1320	Reissue No. 708		42.00
5	D. N. Syford	1321	Premiums	22.00	
5	Seth Abbott	1322	Premiums	1.00	
8	Geo. W. Stabler	1323	Premiums	10.00	
8	Thomas Andrews	1324	Premiums	58.50	
8	Retzleff Bros.	1325	Premiums	13.50	
8	Geo. F. Hart	1326	Premiums	35.00	
8	Edw. Schuler	1327	Premiums	1.00	
8	Geo. Allen	1328	Premiums	24.50	
8	W. R. Holt	1329	Premiums	9.00	
8	John O. Kane	1330	Premiums	4.00	
8	C. G. Nootz	1331	Premiums	1.50	
8	A. C. Shallenberger	1332	Premiums	120.50	
8	S. A. Nelson	1333	Premiums	6.00	
8	J. G. Brenizer	1334	Premiums	44.00	
8	J. R. Mansfield & Son	1335	Premiums	11.50	
8	G. H. Hasebrook	1336	Premiums	40.00	
8	Howell Bros	1337	Premiums	10.00	
8	G. A. Bailey	1338	Premiums	1.00	
8	Robert Guthrie	1339	Premiums	1.50	

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
October					
8	Easton & Hendershot	1340	Premiums	2.00	
8	Bellows Bros.	1341	Premiums	58.50	
8	T. K. Thomson & Sons	1342	Premiums	75.00	
8	Thomas Hunt	1343	Premiums	1.00	
8	A. F. Graves	1344	Premiums	5.00	
8	Geo. H. White	1345	Premiums	8.00	
8	Chas. F. Mitchell	1346	Premiums	4.00	
10	H. Hollenbeck	1347	Pay-roll to date		286.90
10	Etta Yont	1348	Premiums	1.00	
10	G. A. Bailey	1349	Premiums	29.00	
11	W. Wood Bute	1350	Premiums	6.00	
12	Gertrude Kinkaide	1351	Premiums	1.75	
12	Chas. Scully	1352	Paid for labor		3.50
12	Chas. Scully	1353	Salary for Sept.		16.66
15	Neb. Telephone Co.	1354	Phones		5.20
15	Pacific Express Co.	1355	Express		15.01
15	W. R. Mellor	1356	Telegrams and incidentals		8.03
15	Wheeler Bros	1357	Lumber and tile		230.15
15	G. W. Hervey	1358	R. R. fare		2.20
15	E. Filley	1359	R. R. fare		4.20
15	O. P. Hendershot	1360	R. R. fare		3.42
15	Pearl Foster	1361	Premiums	1.50	
15	Anna Burckhardt	1362	Premiums	1.00	
15	Blanche Edmiston	1363	Premiums	2.00	
15	Wm. Roca	1364	Premiums	.50	
15	Ada DeNoon	1365	Premiums	2.00	
22	McDonald & Brantley	1366	Premiums	94.00	
22	W. R. Mellor	1367	Error in prem. list	10.41	
23	W. H. England	1368	Ins. speed barn		50.00
25	Christian & Lang	1369	Premiums	116.00	
25	Paul Thompson & Sons	1370	Premiums	45.00	
25	H. L. Cantine	1371	Premiums	8.00	
25	Oliver Hammers	1372	Premiums	66.00	
31	Givens Bros.	1373	Part payment grad.		500.00
November					
1	Chas. Scully	1374	October salary		25.00
1	Mary C. Fox	1375	Oct. 14 to Oct 21 sal.		36.82
1	W. R. Mellor	1376	October salary		166.66
2	Geo. E. Darwin	1377	Premiums	25.00	
2	Chas. Branson	1378	Premiums	15.00	
8	Chas. Scully	1379	Labor		19.25
9	Lucky & Ketterer	1380	Premiums	5.00	
12	L. W. Pomerene & Co.	1381	Plumbing		3.50

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
November					
12	Peter Youngers	1382	R. R. fare and meals		3.52
16	Mary C. Fox	1383	Salary to Nov. 16		34.66
23	Givens Bros.	1384	On contract		600.00
23	Rudge & Guenzel Co.	1385	Hose cart and hardware		87.15
26	Western Union Tel. Co.	1386	Telegrams		11.15
26	D. L. Russell	1387	Labor in office		7.25
29	E. A. Stevens	1388	Raising stock barn		681.93
December					
7	C. T. Graves	1389	Sent to Farmers Bk., reissue warrant No. 155, series 1906		25.00
9	W. R. Mellor	1390	Salary for Nov.		166.66
10	Givens Bros.	1391	Part pay. moving dirt.		350.00
10	Chas. Scully	1392	Salary for Nov.		25.00
12	Givens Bros.	1393	Bal. borrow pit north of speed barn		1039.00
12	O. P. Hendershot	1394	Railroad fare		3.42
12	O. P. Hendershot	1395	Delegate to Shorthorn Breeders' Ass'n		42.70
12	E. Z. Russell	1396	Railroad fare		2.80
12	Peter Youngers	1397	Railroad fare		2.52
12	F. E. Bottenfield	1398	Appro. 1907 winter meeting		6.00
12	Benton Bros.	1399	Printing		7.50
	Void	1400			
12	State Journal Co.	1401	Claim blanks		8.75
12	International Har. Co.	1402	Repairs		1.20
12	Nebraska Tel. Co.	1403	Phones to Dec. 31		28.30
12	Western Union Tel. Co.	1404	Telegrams		.97
12	G. W. Hervey	1405	R. R. fare to Dec 12th meeting		2.20
12	E. Filley	1406	R. R. fare to Dec. 12th meeting		4.20
12	W. R. Mellor	1407	Postage		10.00
12	J. G. Elseffer, Agt. U. P. R. R.	1408	Switching charges C. G. Nootz from fair grounds		3.00
12	Short Bros.	1409	Hardware		5.40
12	Lincoln Paper Co.	1410	Paper and twine		11.50
12	W. R. Mellor	1411	Delegate to Nat. Ass'n Fairs & Expositns.		34.20
12	Peter Youngers	1412	Delegate to Chicago		36.90

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
December					
12	J. H. Ball	1413	Premiums	20.00	
17	Harlin Parish	1414	Premiums	8.00	
17	Neb. Tel. Co.	1415	Phones		6.00
18	F. C. Kantz	1416	Premiums	1.00	
18	Edw. Stockfield	1417	Premiums	.25	
18	Harris Poultry Co.	1418	Premiums	6.25	
18	Moll Bros.	1419	Premiums	2.50	
18	W. R. Gaylord	1420	Premiums	.25	
18	L. McCandlass	1421	Premiums	2.75	
18	C. S. McCandlass	1422	Premiums	7.00	
18	Harold Swan	1423	Premiums	1.75	
18	J. E. Lundgren	1424	Premiums	.25	
18	Mrs. John Hensler	1425	Premiums	3.25	
18	H. M. Stephens	1426	Premiums	1.00	
18	C. H. Green	1427	Premiums	.50	
18	Ed. Eggert	1428	Premiums	3.75	
18	O. R. Myers	1429	Premiums	.75	
18	J. G. Gourley	1430	Premiums	5.50	
18	W. R. Chapline	1431	Premiums	1.25	
18	L. W. Park	1432	Premiums	6.00	
18	A. H. Smith	1433	Premiums	15.00	
18	H. C. Witte	1434	Premiums	10.00	
18	Ashley A. Demitt	1435	Premiums	1.00	
18	C. W. Brehm	1436	Premiums	.75	
18	E. E. Smith	1437	Premiums	2.51	
18	Raymond Stryker	1438	Premiums	2.50	
18	Byron J. Smith	1439	Premiums	.75	
19	Pound's Plumbing Co.	1440	Plumbing		70.10
20	D. L. Russell	1441	Asst. in office		9.75
23	Dale Russell	1442	Packing books		6.00
24	Emil Von Bergen	1443	Premiums	2.00	
24	Givens Bros.	1444	Grading payment		200.00
30	Karl Ludwig	1445	Levels on fill		10.00
30	Benton Bros.	1446	Postage and printing.		28.00
30	Western Supply Co.	1447	Plumbing supplies		3.08
30	Cooper & Cole Bros.	1448	Plumbing sup. (bal.).		1.36
30	Lincoln Paper Co.	1449	Wrapping paper		2.00
30	Smith Premier Co.	1450	Typewriter No. 124889		52.75
30	Melick's Stables	1451	Livery		17.50
30	Maynetta Marks	1452	Sal. for Dec. 1907		48.34
30	W. R. Mellor	1453	Sal. for Dec. 1907		166.65
30	Chas. Scully	1454	Sal. for Dec. 1907		25.00
30	Am. Ass'n Fairs & Expo.	1455	Annual dues for 1908.		25.00
30	W. R. Mellor	1456	Postage		10.00

Date.	To Whom Issued.	No.	For What Issued.	Prem.	Misc.
December					
31	Givens Bros.	1457	Bal. on excavation		806.02
31	Ensign Omnibus & Trans. Co.	1458	Livery		5.00
31	Neb. Material Co.	1459	Building material		369.01
31	Globe Del. Co.	1460	Freight and drayage		23.66
31	Adna Dobson	1461	Engineering		23.50

President Youngers: The next thing in order will be the reading of the report of the Treasurer.

TREASURER'S REPORT.

To the Members of the State Board of Agriculture.

Gentlemen: Your Treasurer submits the following report of the moneys received and paid out during the past year, as follows:

Balance January 17, 1907		$37,406 12
Received miscellaneous	$567 61	
Interest on deposits	678 25	
Speed	4,122 90	
Stalls	1,613 00	
Concessions	9,076 25	
Shorthorn special	544 82	
Railroad coupons	8,422 25	
General admissions	34,314 50	
Amphitheatre	6,650 50	
Reserved seats	196 00	
State warrant	2,000 00	68,186 08
Total receipts		$105,592 20
Less warrants paid		79,463 91
Balance January 20, 1908		$26,128 29

In the above balance $4,848.26 is in the reserve fund and $21,280.03 is in the general fund.

Respectfully submitted.

E. Z. RUSSELL, Treasurer.

COMPARATIVE STATEMENT OF THE FINANCIAL AFFAIRS OF THE NEBRASKA STATE BOARD OF AGRICULTURE.

Year	Balance	General Admission	Amphitheatre	Quarterstretch	R. R. Coupons	Concessions	Speed Department	Stalls and Pens	Wagon Permits	Camping Permits	State Apportionment	Score Card	Miscellaneous Items	Forage	Total
1891......	$13405 25	$11577 00	$2439 25	$654 50	$15165 00	$3730 00	$3662 00	$916 50	$452 50	$137 00	$2000 00	$75 00	$1106 61	$411 90	$55731 61
1892......	15234 89	11902 50	2761 50	542 00	13203 50	3357 50	5142 95	1234 50	303 50	147 00	2000 00	50 00	564 41	691 55	57135 80
1893......	13970 43	9411 50	1826 75	281 00	4473 35	3229 65	4251 00	813 50	182 00	109 50	2000 00	75 00	706 00	427 25	41756 93
1894......	2978 58	7977 50	1590 00	200 00	8756 25	2026 50	2572 50	841 05	75 00	60 00	2000 00	60 00	642 27	336 30	30056 55
1895......	4 88	23590 00	5757 00	68 50	8663 25	3482 30	3834 00	1205 94	57 00	21 50	2000 00	87 50	5927 05	444 80	55143 72
1896......	1089 88	18617 50	2096 75	313 00	6790 00	2934 50	3937 20	487 25	92 00	3 00	2000 00	100 00	2445 94	262 80	41169 82
1897......	332 95	14672 00	2938 25	203 50	....	2695 10	3312 54	1278 42	129 00	10 50	2000 00	75 00	3238 05	391 00	31276 31
1898......	1448 86	....	....	....	....	....	....	....	....	....	....	....	130 00	....	1578 86
1899......	445 52	....	....	....	....	....	....	....	....	....	....	Lincoln	332 95	....	778 47
1900......	244 46	9717 50	1952 55	61 00	7038 25	2183 79	1228 90	454 66	94 00	31 50	6000 00	....	3860 73	....	32867 34
1901......	391 73	12522 50	2196 50	119 50	5749 00	2063 05	1046 45	723 55	40 50	29 00	3000 00	....	822 08	....	28703 86
1902......	2548 26	15511 00	2565 50	193 50	7288 00	2302 41	2005 75	810 00	134 00	25 00	3000 00	100 00	1594 66	....	38078 08
1903......	1557 42	18285 00	3960 00	486 50	7805 50	4082 41	2577 40	1161 00	160 00	29 50	3000 00	....	744 35	....	43849 08
1904......	6187 89	16634 50	4667 75	....	9909 75	4177 57	1654 75	1600 00	215 15	33 50	3000 00	....	510 34	....	48591 20
1905......	15646 41	15488 50	2866 50	455 25	10456 25	5204 80	1409 90	1145 00	91 00	2 50	3000 00	....	756 15	....	56522 26
1906......	11079 03	28872 50	7830 75	....	16614 75	6516 50	2711 40	1332 10	126 50	6 00	3000 00	....	409 83	....	78499 36
1907......	37406 12	34314 50	6846 50	....	8422 25	9076 25	4122 90	1613 00	....	....	2000 00	....	1790 68	....	105592 20

President Youngers: The next order of business will be the report of the Board of Managers.

REPORT OF BOARD OF MANAGERS.

To the Officers and Members of the Nebraska State Board of Agriculture, Greeting:

The past year has been one that has required more time and thought of your Board of Managers than any previous year and this is fully explained by the amount of changes and improvements that it seemed wise for us to make. It required several meetings of your Board and many trips to the ground to decide to reclaim or rebuild the land west and north of the B. & M. tracks and in making this land accessible and useful it took a large amount of moneys and we trust you will approve of the expense incurred.

You must all appreciate that our grounds are small and in order to accommodate the large exhibits and crowds that annually attend the fair, that sooner or later every foot of ground will necessarily have to be used.

When the appropriation was made by the legislature to build the new cattle barn we hoped that it could be done in time for the 1907 fair, but this appropriation was not available until July 1 and the time was too short to enable the Board of Public Lands and Buildings to construct the barn. However, the barn is now well under way and will be completed early in the spring, and with this new barn we must have a live stock pavilion, of a capacity of sufficient size to accommodate our exhibitors. This must be built by an appropriation from the state and the time to commence the campaign for the pavilion is this year, and not wait until the legislature meets. The building now used is inadequate for the purpose it was intended, as a live stock pavilion, but can be used for many other exhibits.

One of the largest demands from the patrons who attended the fair is that we provide a more commodious grand stand at the race track, and we think they have good grounds and are justified in making this request, and I trust in the near future we will be enabled to give them some relief.

Your Board in the past year have made permanent improvements, in amount approximately $33,000, nearly double the amount incurred any previous year since the state has owned the grounds. One of the largest items of expense was the filling up and grading of about ten acres of ground that required from one to seven feet of earth to bring it up to the necessary grade, and we are not quite through with the grading. In the very near future it will be necessary to fill up about two more acres of ground that will be very valuable to us.

We have moved thirteen swine barns from the east side of the grounds to the west side, and put cement piers under same; also built seven new swine barns; making a total of twenty barns.

The speed sheds have been moved from the south side of the race track to the north side, reconstructing them and making them into modern speed barns, which required new roofs, new ends, footings and a large amount of lumber and labor and with the extensions added give us accommodations for 150 speed horses.

The new fish building built south of the dairy building is something that has been needed for many years, and we are sure was very much appreciated by our patrons.

A new brick addition has been added on the west end of the woman's public comfort building, making the toilet room for women more than double its former size, and using the basement room for a toilet room for men. When this building was built some four years ago there was a mistake made in putting a cement floor on wood joist which rotted out and gave way during the fair, and since the fair we have had all the floor removed and enough earth filled in to bring it up to necessary grade and a new cement floor put down which we trust will last for many years. There has been added about 1,600 feet of sewer the past year and so arranged that branches can be taken from any part of the ground.

One thousand eight hundred feet of new four-inch water main connecting same with branch pipes to swine, cattle and horse barns, and three extra fire hydrants have been put in.

We have purchased and placed on the grounds one hose cart with five hundred feet of standard fire hose.

A new water closet and sink has been placed in the residence on the grounds.

New permanent hitching racks have been built along the south side of grounds. New floor and foundation put in and under the old fish building. Several hundred loads of cinder have been used for walks.

All buildings have been painted with two coats of paint, and when you stop to think of the number of buildings on the ground this expense was one of the large items.

Toilet buildings and superintendent's offices have been moved from place to place to suit the convenience of our exhibitors and patrons.

The Secretary's office at state capitol was in bad repair and a new metal ceiling has been put on and walls covered with burlap which will last for many years to come with a small expense. We desire to call to your attention the fact that several thousand dollars of the expenditure above mentioned consists of improvements below the surface of the ground and does not make the showing that permanent buildings would have made. Your Board deemed it wise to replat the grounds, extend the water system and sewerage for sanitary purposes, move many of the buildings to other locations so that in the future all buildings and streets would make a more perfect grounds when completed.

Your Board at all times has used their best judgment in handling our exhibitors and patrons in such a manner as to avoid accidents and as careful as we have tried to be, one accident occurred on the carriage crossing to the quarter stretch which we are pleased to say was not as serious as it might have been as we were able to adjust same at an expense of $140, and we recommend to the incoming Board the changing of the carriage entrance to quarter stretch to a point west of the scoring stretch.

Your Board has had twenty-two meetings during the past year on dates as follows: January 17, February 7, February 28, April 4, April 30, May 16, June 6, July 12, July 25, August 9, August 20, August 30, 31, September 1, 2, 3, 4, 5, 6, 7, October 14, December 12, and January 20.

The Board meetings have been well attended and only in rare cases has a member asked to be excused. The meetings have been very harmonious and a unity of strength has prevailed which has made our duties pleasant to perform, and we take this opportunity of here expressing our appreciation for the able assistance given us during the fair by the superintendents and their assistants, as a more loyal, hard-working lot of men and women we do not believe can be found in the state of Nebraska.

Respectfully submitted,

THE BOARD OF MANAGERS,
C. H. RUDGE, Chairman.

President Youngers: We will now listen to the report of the Auditing Committee.

AUDITING COMMITTEE'S REPORT.

Your Auditing Committee has carefully checked over the reports of the Secretary and Treasurer as follows:

January 17, 1907, balance on hand	$37,406 12
Year 1907 collected from all sources	68,149 58
Making a total of	$105,555 70
Warrants paid, Treasurer's report	79,463 91
Balance on hand at close of year 1907	$26,091 79

We find that this money is deposited as follows:

Plateau State Bank, Herman, certificate of deposit	$2,424 26
Citizens State Bank, Blair	2,424 00
Loup City State Bank	2,000 00
Farmers & Mechanics Bank, Havelock	2,000 00
Banking House of A. Castetter, Blair	2,000 00
The Osceola Bank	1,000 00
Citizens Bank, Ogallala	1,000 00
First National Bank, Lincoln, subject to check	13,203 14
Miscellaneous items for which Treasurer is entitled to credit	76 89
	$26,128 29

which shows an overpayment by the Secretary to the Treasurer of $36.50, which amount the Secretary is entitled to a warrant for. In comparing the Treasurer's report with the report of the Secretary we find warrants of 1907 issue amounting to $76.42 outstanding, same never having been presented for payment. All of which the Auditing Committee beg leave to submit.

GEORGE F. DICKMAN.
E. M. SEARLE, JR.
WM. FOSTER.

President Youngers: You have heard the report, gentlemen. What will you do with it?

Mr. Mickey: I move the report of the Auditing Committee be accepted and the committee be discharged.

President Youngers: You have heard the motion that the report be accepted and the committee be discharged. All in favor of same say Aye. Contrary, No. The motion is carried unanimously.

Now the next thing in order would be the report of the committee on the revision of the premium list. If there is no objection, in order to expedite matters in taking up the report of this revision committee, we will consider the report adopted as read by the chairman; that is, that portion not objected to will be accepted by this body as read. Should there be any objections while he is reading, we will take up the matter for consideration.

REPORT OF COMMITTEE ON REVISION OF PREMIUM LIST.

Mr. President: Your committee on revision of the premium list, rules, and regulations beg leave to submit the following report. Your committee have been in session since Friday, January 17th, and have given the matter of revision of rules and regulations most painstaking investigation and consideration. So far as time would permit we have classified under appropriate headings the various rules and regulations governing the affairs of the association. We have taken the liberty of striking out many provisions which were direct repetitions or might be construed as advice and suggestions to exhibitors rather than a rule or regulation of the Board. Your committee suggests that as some advice and suggestions to exhibitors seems desirable, that the secretary group such matter as he deems necessary in this respect under a heading "Remarks," and assign it a place by itself in the premium list.

The classification and grouping of rules and regulations make it well nigh impossible for your committee to report upon amendment or alterations in their work by following the present rules as printed and classified in the premium list. We have therefore arranged our work as we would suggest that it appear in the premium list, and with your permission will present it in that form at the present time.

Mr. Bassett here read the conclusions of the Premium Revision Committee, which, after discussion and alterations, was accepted as shown in the 1908 premium list.

Secretary Mellor: The speaking this evening will be held at the Temple, corner Twelfth and R streets. The subject will be "Education as Related to Vocation," by Frank H. Hall, of Aurora, Ill. It is hoped that as many as possible will attend.

Mr. Cook: I understand that definite action on this report of the revision of the premium list will be left over until tomorrow morning.

President Youngers: Such is the understanding.

Mr. Mann: I move that we proceed with the nomination for members of the Board and that, after same are made, the president appoint a committee on nomination. Seconded and carried.

President Youngers: Nominations are in order for members of the Board.

LIST OF NOMINATIONS.

Charles Mann, Dawes County.
V. Arnold, Richardson County.
Geo. F. Dickman, Seward County.
W. R. Mellor, Sherman County.
L. Morse, Dundy County.
M. B. Atkins, York County.
Peter Youngers, Fillmore County.
G. W. Hervey, Douglas County.
Jos. Roberts, Dodge County.
William Foster, Lancaster County.
R. M. Wolcott, Merrick County.
E. Z. Russell, Washington County.
W. F. Johnson, Clay County.
R. L. Mabon, Hamilton County.
J. D. Ream, Custer County.
W. G. Unitt, Seward County.
W. E. Ewing, Franklin County.
A. C. Shallenberger, Harlan County.
L. H. Cheney, Frontier County.
W. W. Cole, Antelope County.
J. G. Brenizer, Custer County.
H. R. Howe, Nemaha County.
W. S. Morlan, Red Willow County.
C. G. Crews, Hitchcock County.
G. E. Hotchkin, Johnson County.

Mr. Haws: I move that the President appoint a nominating committee of five. Seconded.

President Youngers: It is moved and seconded that the President appoint a committee of five on nominations. Are you ready for the question?

Mr. McLeod: Mr. Chairman, I arise to object to the appointment of this committee. I think we, as a body, are fully capable of making the selection of men who will be a credit to this Board, from this list of nominations. I was informed before coming here that this was a "close corporation" and that everything was "cut and dried" before the meeting; therefore it was useless for me to come. If we elect our own members in open meeting, without resorting to the services of this committee, it will cause such conclusions to become discredited in the state; therefore I hope this body will follow the primary system and elect the new members here in this meeting.

Mr. Taylor: I think the gentleman who was speaking is right in his conclusion. It would be much better for us to elect our members by this system rather than with a nominating committee, to which system I strenously object.

Secretary Mellor: I think the main objection to the election of these men in this meeting is from the fact that the same should be distributed over the state, according to the districts. Unless you have a map before you it is hard to do justice to all portions of the state. By this method as here suggested, you might get all the membership from one locality. If this body concludes to make the selection here, personally I have no objections.

Mr. McLeod: We have had a successful fair, but I have a feeling it is a little contrary to this democratic body to send out a nominating committee; and I will say in addition that, while it is possibly true four or five men can work to a better advantage in regard to location, it simply resolves itself to this: the President might as well make the selection as have a committee do it, because it lies in the power of the President to practically select every member.

Mr. Haws: I do not think the gentleman intends to insult our chairman or means it in that way. It has been customary to have the members in different parts of the state, and we all know that in order to make this fair a success we must have the membership scattered.

Mr. Atkins: This controversy brings to my memory the election of the directors at large in the insurance company. We tried this procedure of electing in open meeting and the first thing we knew we had all our directors east of Lincoln. If we ballot on members in this manner we must distribute them over the state, making some sort of a division from which to draw. I think the present system the only logical one, unless we district the state.

Mr. Cook: Of course it may be that this nominating committee to be appointed by the President will simply go to work and look over the geographical situation and pick out a man who, in their judgment, would best serve the Board. If their recommendations are not satisfactory to this Board, we have the opportunity to elect whom we please. The nominating committee plan has been the method which has proven most satisfactory in the locating of the membership heretofore.

Mr. Taylor: While we are speaking of selecting them from different parts of the state, I agree it is right and should be done. So far as selecting the members of this Board is concerned, I have attended these meetings for about twenty-five years, and it is true that this is an established rule to make the selection in this way; but I do not think it the best way. I believe the state should be districted. I am willing to leave it to a vote whether the western part of the state is well represented.

Mr. McLeod: As I have said before, when I came down here I was told as president of our society, that it was no use for me to try to do anything; it would do no good to come here; that the thing was "cut and dried"; but still I feel it is proper and correct that we should have a voice in this selection. I understand it has been customary that whoever this committee name will go right through, and I believe the only fair way is to vote by ballot and have the entire membership say who will be a member.

President Youngers: I would like to say, for information, that it has been the rule to select as members of this nominating committee two from the State Board of Agriculture and three from the county presidents, not members of the Board, which gives the county presidents practically the majority on the committee. That has been the rule heretofore.

Mr. Lewelling: I am surprised that this has come up for discussion here, but I want to say a word. I think I have been in touch with as many people in the state in the past few months as any man here, in my farmers' institute work. I want to say that there is a feeling in the state that on this Board there is "a wheel within a wheel" which absolutely works. Personally I believe that what we do is right, but there is that feeling and I am perfectly willing that all members should be voted on and that every one here shall have the right to vote. And I believe that, although we depart from the usual custom, it will give better satisfaction outside in the state to elect our members in open meeting instead of by the service of a nominating committee. It has worked well in the Poultry Association of which I am president, and has been fairly distributed over the state; much better in fact than I supposed could possibly be.

A Member: Question.

President Youngers: The motion, as I understand it, is that we proceed to vote direct instead of by the nominating committee.

Mr. McLeod: My motion has been amended to vote by ballot.

President Youngers: All in favor of voting by ballot say Aye; contrary, No. The noes have it and the motion is lost. The original question will not be voted on. All in favor of the committee being appointed by the chairman will say Aye; contrary, No. The ayes have it and the motion is carried for the chairman to appoint a nominating committee. As such committee I will appoint Mr. I. W. Haws of Kearney County, Mr. Ralph Searle of Clay County, Mr. William James of Saline County, Mr. L. K. McGaw of Polk County and Mr. M. F. O'Malley of Greeley County.

Mr. Bassett: I move that the committee of three be appointed by the President, to whom the recommendations of the officers be referred, and that they report tomorrow morning on the recommendations of the President and Secretary in their reports. Motion seconded by Mr. Lewelling and carried.

President Youngers: I will appoint on that committee Mr. Mickey, Mr. Bassett and Mr. Wolcott.

Mr. Haws: I would like to know where the committee on nominations shall meet?

President Youngers: I would suggest the committee meet in room 5 of the Lindell Hotel at 7:30 this evening.

Mr. Haws: It will be understood then that this committee on nominations will meet at the Lindell Hotel, room 5 at 7:30 this evening. If there are any present who desire to appear before this committee and present the claims of their different candidates, we shall be pleased to have them do so.

President Youngers: Is there anything further to come before the Board this evening. If not, a motion to adjourn is in order.

Mr. Russell: Mr. President, I move we take a recess until 9:30 o'clock tomorrow morning, at which time we will meet in room 105 at the state farm. Motion seconded and carried.

EVENING SESSION.

The evening session convened at the Temple, Twelfth and R streets, at 8 o'clock P. M. and was presided over by E. A. Burnett, who introduced Mr. Frank H. Hall, of Aurora, Ill., who made the following ad dress:

EDUCATION AS RELATED TO VOCATION.

FRANK H. HALL, AURORA, ILL.

Every boy must learn reading, 'riting, and 'rithmetic—the traditional "three R's." What more? Must he learn geography—the geography of Nebraska, of the United States, of North America, of South America, Europe, Asia, and Africa; commercial geography, physical geography, political geography, mathematical geography? Must he know the capitals and boundaries of all the states and all the countries? Must he know the principal cities of the world, the great river systems, the mountain peaks and the mountain ranges? Must he learn all that is known of the oceans, the ocean currents, the seas, gulfs, and bays, and the trade winds? (Let it be remembered that the best educated man in Nebraska does not know one thousandth part of the geography that might be learned.) Must the boy learn all that I have named and a thousand times as much in order that he may become a cultured, useful, efficient, well-educated citizen of the United States? Surely not. Then how much? Where shall be line be drawn between the geography he must know and that which he may neglect? In other words exactly how much geography must a man know in order to be intelligent, and how much may he neglect without being an ignoramus?

Must every boy learn history—the history of his own state, his country, the history of the "mother country," of Rome, of Greece, of France, of the German Empire, ancient history, mediæval history, modern history? Must he learn all these in order to be educated? Surely not.

Then how much? Where shall the line be drawn between the history he must know and that which he may neglect?

Must he learn algebra, geometry—plane geometry and solid geometry, plane trigonometry and spherical trigonometry, calculus—differential calculus, integral calculus, and the imaginary calculus? Must he learn all these and much more in order to be thoroughly prepared for life's duties? Surely not. Then how much? Where shall the line be drawn between the mathematics the boy must know and the mathematics he may or may not know?

Must he become familiar with the poetry and the philosophy of all ages?

Must he learn geology and botany and chemistry and astronomy and zoology and bacteriology and thermatology?

Must he learn Latin and Greek and German and French and Hebrew and Spanish and Italian and Sanscrit and Esperanto? Must he learn all these in order to be equipped for his life-work on the language side?

Must he study music and be able to distinguish between that which is classic and that which is commonplace or inferior? (Some of us are obliged to agree with Bill Nye on the music question. He says he likes classical music,—it is so much better than it sounds!)

Must he learn something of painting and sculpture—of Raphael and Velasquez and Titian and Michael Angelo and Correggio and Leonardo and Van Dyck and Rembrandt and Murillo and Rubens? Must he know of all these and a hundred others in order to be a symmetrical man?

Must he read Shakespeare and Byron and Chaucer and Bacon and Milton and Pope and Addison and Goldsmith and Gibbon and Scott and Carlyle and Emerson and Walt Whitman and Lowell and Bryant and Holmes and T. B. Aldrich and Marion Crawford and James Whitcomb Riley and Drummond and Lyman Abbott and Washington Gladden and Roosevelt and Fra Elbertus and Rudyard Kipling?

Must he know of the work of Huxley and Tyndall and Spencer and Hegel and Comte and Commenius and Froebel?

And I have not suggested a tenth of what is offered a twentieth century student in a single university today. Must the student take all these and ten times as much in order to be a broadly cultured man—in order to be properly equipped for his life-work?

Surely not. You may know a thousand things that I do not know; I may know a thousand things you do not know, and we may be equally well educated, equally happy, equally efficient, equally serviceable to humanity.

Neither of us knows one millionth part of what might be learned,—not one millionth part of the really valuable knowledge—valuable to somebody—in the accumulated wisdom of the world. But if each can do his work and do it well, he is well educated.

But the measure of our knowledge is not the measure of our efficiency.

One may have great knowledge and be worth but little to the world. One may have little knowledge and be worth much to the world.

We no longer measure men by what they know, but by what they can do of work that needs to be done.

Knowledge, then, to be valuable must relate itself to the doing of useful things.

Mere breadth in education is no more important than depth. It is the product of the two, expressed in units of useful activity, that gives the true measure of manhood. Our students must learn to take the step from knowing to doing if the community is to realize on its educational investment.

Fra Elbertus says there are some men who know so much that it runs over and they stand in the slop.

There should be no slop about it. What a man knows should be digested and assimilated and should re-appear as strength to do something that needs to be done.

Getting knowledge for use is praiseworthy; but when it becomes an end in itself, it is to be condemned. Getting knowledge for its own sake is but little better than getting money for its own sake.

"Greediness for intellectual wealth," says Charles Dudley Warner, "is scarcely more praiseworthy than greediness for material wealth."

To how much learning—to how much money—to how much of any of the good things of this world is a man entitled?

According to Carlyle's "Pig Philosophy," he is entitled to as much as he can get out of the general swine's trough without being rapped too hard on the head for it.

According to the better human philosophy—I might almost say, divine philosophy—one is entitled to all he can get honestly and use effectively. No more. He is entitled to no more; he should have no more.

"Inapplicable knowledge," says Hegel, "is a cumbrous load; only that knowledge which subserves the ends of life becomes a working power."

But what are ends of life from the standpoint of the intelligent American citizen? I answer, contribution to human well-being; the general uplift of the race. Nothing short of this, nothing beyond this, can justify general taxation for the support of the schools.

Who, then, are the well-educated people of our time and country? I answer, those who contribute to the uplift; those who do useful things.

What shall a boy learn in order that he may be properly educated? I answer, all that he possibly can learn that will develop and increase his desire and his power to do useful things—nothing more, nothing less.

The power without the desire is no better than the desire without the power. Hence every ideal should involve the getting and using of power in the doing of something that needs to be done. Better no power at all than power with wrong desire.

Moreover, time spent in power-getting that ought to be spent in power-using is ill-directed effort. Acquisition of unused power is no more praiseworthy than the acquisition of unused wealth.

Every young man, then, should be so educated (1) that he will want to be useful, and (2) that he will have the power to do the thing he wants to do,—as much power as he can develop and use.

Again I ask, who are the educated? But I am not alone in asking and attempting to answer this question. Says Rev. W. A. Bartlett:

"The cook in the kitchen who can make better bread than the one who pays her wages, is to that extent better educated than her mistress who may greatly adorn a literary society.

"I have no objection to a woman's knowing Browning. But I would have her consider, too, how well she is equipped to furnish digestibly cooked food to a hard working husband in case the cook leaves or in case of a small salary.

"To be sure the life is more than meat and the body than raiment. But the ability to make a dress, to drive an engine or grip car, to create a pie or use a tool, and do these things well, should take far higher rank in our educational estimate."

Says a distinguished American writer: "The man who is fitted to take care of himself in all conditions in which he may be placed, is, in a very important sense, an educated man. The savage who understands the habits of animals, who is a good hunter and fisher, is a man of education, taking into consideration his circumstances. The graduate of a university who cannot take care of himself—no matter how much he may have studied—is not an educated man."

The greater part of the contribution a man makes to human well-being, he makes through his vocation. Hence more and more education must relate itself to vocation. Listen to the testimony of some of the great educators on this point:

Says Dr. E. J. James of the University of Illinois: "In a word, the state university which most fully performs its function for the American people will stand simply, plainly, unequivocally, and uncompromisingly for training for vocation; not training for leisure nor training for scholarship except as training for scholarship is a necessary incidental to all proper training for vocation or may be a vocation in itself."

Says Professor Angell of the University of Chicago: "If trade subjects are introduced into universities, why not into high schools? The children deserve such an education as this." Professor Angell also says: "The club women of the state should urge the establishment of trade-schools for young people. In order to get training for useful vocation it is now necessary to commit some crime and get into the reform school."

Says Superintendent Cooley of Chicago: "Vocational study must be the backbone of the high school of the future—manual training, household arts, and business practice." Superintendent Cooley also says: "Educators and school boards in their zeal to produce wise men should not forget that one of the chief functions of the public school should be to give to the child increased capacity for earning a living."

Says Superintendent Dyer of Cincinnati: "It is the duty of the schools to give a boy a chance to learn the trade that he has a liking for. Industrial training in the schools has been too long neglected."

Says Dr. Eliot of Harvard: "The perception or discovery of the individual gift or capacity will often be effected in the elementary school; but more generally in the secondary; and the making of these discoveries should be held one of the most important parts of the teacher's work."

Says Superintendent Orth of Cleveland: "Our public schools should seek to discover the aptitude of children and then develop them according to their vocational desires."

But, best of all, the new phases in the school curriculum make the work of greater ethical value. To lead a pupil towards work is ethical. To teach a child economy and thrift is ethical. To teach a child to get money by earning it is ethical, To give him the desire to get money without earning it is dangerous in the extreme. To increase his desires for enjoyment faster than you increase his capacity to earn is to lead him towards the danger line; and this is true even though the enjoyments are of the highest intellectual sort.

Says President Roosevelt: "The chance to do good work is the greatest chance that can come to any man or woman in our generation or in any other generation." President Roosevelt also says: "To train boys and girls in merely literary accomplishments to the total exclusion of industrial, manual, and technical training tends to unfit them for industrial work; and in real life most work is industrial."

I often hear it said, "Every boy and girl in America is entitled to a liberal education," but what is a liberal education? Let Nicholas Murray Butler answer: "The designation liberal has come to be claimed as the sole prerogative of a very narrow and technical course of study that was invented for a very narrow and technical purpose, and that has been imperfectly liberalized in the intervening centuries."

Another bold spirit has said, "No man is liberally educated who has not learned to make a living."

I often hear it said that early specialization results in narrowness. Is this true? Let Dr. John Dewey reply: "It is our present education which is highly specialized, one-sided, and narrow. It is an education dominated almost entirely by the mediaeval conception of learning."

How narrow, how broad, how deep ought one's education to be? I answer, Each should have that culture and that information and that training which will enable him to contribute in largest measure to the general good. For it is as sure as the law of gravitation that he who can and does contribute most gets most out of life for himself. But in preparing one's self for useful activity the injunction of Emerson may well be kept in mind: "The one prudence in life is concentration; the one evil is dissipation; and it makes no difference whether our dissipations are coarse or fine. * * * Friends, books, pictures, lower duties, flatteries, hopes—all are distractions which cause oscillations in our giddy balloon and make a good poise and a straight course impossible. You must elect your work. You shall take what your brain can and drop all the rest. Only so, can that amount of vital force accumulate which can make the step from knowing to doing, * * * a step out of the chalk circle of imbecility into fruitfulness."

MORNING SESSION.

January 22.

The members and delegates to the State Board of Agriculture met at 9:30 a. m. in room 105, State Farm Agricultural Building, with President Youngers in the chair.

President Youngers: Is there any person present who has not handed in their credentials to the credential committee? As I understand it, the committee have received none since last night, and if there are any present would like to have them present their credentials. If not, we will proceed to the roll call.

Secretary Mellor called the roll, and the president announced a quorum present.

Secretary Mellor: Mr. Chairman, in order to somewhat expedite matters, I move you that $5 be awarded to each delegate and the amount that they have paid out for railroad fare both coming and going from the city, and that the treasurer be instructed to issue the same to each delegate present, excepting the delegates who live in the city of Lincoln. Motion seconded by Mr. Hendershot.

President Youngers: Are you ready for the question?

Mr. Hervey: I would like to move an amendment that that be made $6, instead of $5. Mr. Mellor accepted the amendment and motion as amended was carried.

President Youngers: I would like to have the report from Mr. Hendershot.

Mr. Hendershot: Mr. President and Gentlemen of the State Board of Agriculture: In order to make this report more intelligible, I have cut out some of the detail of the report as made to the Nebraska Shorthorn Association.

REPORT OF DELEGATE TO AMERICAN SHORTHORN BREEDERS' ASSOCIATION

Mr. President and Members of the State Board of Agriculture—

GENTLEMEN: At the fall meeting of the State Board of Agriculture, held at the state fair grounds, September 6, 1907, I was elected as a delegate to represent this honorable body at the annual meeting of the American Shorthorn Breeders' Association, to be held in Chicago, December 5, 1907.

This meeting was largely reports from standing committees, showing the work the association is doing, much of which is on the lines intended to promote a demand for our Shorthorn bulls.

This association has been sending bulls to old Mexico, and selling there at a loss to the association, in dollars and cents, but by this method they are creating a good southern outlet for the surplus Shorthorn bulls. Colonel Harris is kept in the western field all the time promoting the Shorthorn interest. The National Association duplicated the premiums of all the state fairs in 1907 where they paid $500 or over, up to $2,000, adding $200 for milking Shorthorns if state associations would make a class for them under the rules of their association, and state associations adding $100 to this class, and are arranging to enter the county fairs where they give $200; that is, the National Shorthorn Breeders' Association intend to duplicate all county premiums at county fairs where the association will put up $200, and intend to cut down largely the big donations to the national and Hamline fairs of from $4,000 to $5,000, as we believe it to be to the best interest of the association and the people to encourage the county fairs that have been going down, as we have known to be the case in several instances. However, this has not yet been fully arranged for.

The question of dividing the association money between the cattle owned by exhibitors of the state where the fair is held in what is known as the "open class," has been much discussed and the directors of the American Shorthorn Association have decided to let the older states have but the one class for all. I tried to persuade them to leave Nebraska in the class with the new states, but with what success I do not know at this time. I got the promise, however, that they would consider the matter and notify our secretary later.

I would like to say in regard to this shipment that was sent to Mexico: We sent a delegate down there, Colonel Harris, and found a place to locate these cattle. He made a contract with the different states whereby he could present them with a thoroughbred bull and two heifers. When he got down into the country to General Terrazas' ranch, one of the greatest cattle breeders of that country, owning a large ranch, he introduced the cattle to him; he said he liked them very much and if they did well in that country, he would take all that grew in this country. Respectfully submitted. O. P. HENDERSHOT.

President Youngers: We will now be favored with some music by Mrs. Allen's Mandolin Club. (Music.)

By motion of Mr. Cook, the young ladies were extended a vote of thanks from the board.

President Youngers: Is the Committee on Recommendations ready to report?

Mr. Mickey: Mr. Bassett has asked me to read the report, as he is not present at this time.

REPORT OF COMMITTEE ON RECOMMENDATIONS.

Mr. President: Your committee to consider and report on recommendations made in the president's address and in the reports of the secretary and board of managers would respectfully submit the following:

We recommend the approval by the board of the recommendation by the president in regard to a bureau of information at the state fair; and bulletin board in connection therewith; and for additional buildings and improvements as soon as the finances of the board will permit.

The suggestion in regard to additional street railway facilities is most important in helping solve the transportation problem at the fair, and it is urged that the board of managers use every effort to that end.

We feel that the board of managers should be commended for the wise judgment exercised in the expenditure of funds and in the grading and filling of grounds, erection of buildings and other improvements made on the fair grounds; that all the actions of the board be fully approved and expression made of appreciation of the valuable services of its members, often rendered at considerable personal sacrifice.

We also desire to express approval and to congratulate the secretary on the excellency of his report, showing, as it did, the untold resources of our state and the prosperity and resulting happiness of our people.

S. C. BASSETT.
R. M. WOLCOTT.
O. E. MICKEY.

Mr. Mann: I would like to suggest to the board of managers for the coming year that it is necessary for the benefit of the association that we have a storage barn for our alfalfa hay that is baled. It has to be kept on the outside now, and whenever it gets damp and goes to the exhibitors, it is molded. Last year the board of managers put part of it in the sheep barn to take care of it. There was not sufficient room for the cattle and we had to put the cattle in the hay barn. I would suggest that provision be made so that all baled stuff could be kept dry.

President Youngers: I made that recommendation, and no doubt the board of managers will look after it.

Mr. Rudge: I move that the report of the committee be received, and the committee thanked and discharged.

Mr. Pritchard: There is one matter in regard to the pen business, not only in the swine department but in all departments, and if this committee is to be discharged, won't it make this out of order?

The motion was seconded and carried.

President Youngers: The next thing in order will be the revision of the premium list that was left off last night. Is the committee ready to report further?

Mr. Leonard: I think Mr. Bassett did read the entire report of that and all that we have to do now is to discuss and dispose of the questions left over.

Mr. Hendershot: It is all classified and if any one wants to take up the classes they can find them.

President Youngers: As I understand it, there were two items that were left until today.

Mr. Lewelling: One item that was left over was the question of bees and honey. I was not clear as to the amounts or as to the changes made in Lot I. It shows K in the catalogue.

Secretary Mellor: (Reading from report of revised premium list.)

Mr. Lewelling: The reason I want to call this up is because this is of more importance than some of us have any idea. There is a great amount of alfalfa grown in this state, and we hope this year the acreage will be doubled, and it depends somewhat on the bees for fertilization. It seems to me that the premium was cut down and we ought to raise it, if anything.

Mr. Bassett: We have raised it.

Mr. Lewelling: I have no objection to that. My understanding was that it was cut down.

Mr. Ollis: In regard to Class A. I want to move that the clause (reading from copy), "any one exhibitor will not be allowed more than eighteen stalls," etc., be accepted. Motion was carried.

Mr. Pritchard: In Lot 9, Class C, page 29, I move that the word "nine" be stricken out, and that the matter be left with the executive board or the board of managers, and if they are able to furnish pens for entries, the matter be left entirely at their discretion, and that no exhibitor who has fitted a herd will be shut out this year. If they cannot furnish a sufficient number of pens for all entries by July 1 or within thirty days of state fair, that they instruct the superintendents to prorate pens that they can furnish. Mr. McLeod seconded the motion.

Mr. Leonard: As far as I am concerned, I am not at all in favor of this. I would be perfectly willing to leave it with the board of managers as far as that is concerned, but for this reason I am undoubtedly opposed to it. There are a number of people who only ask for four or five pens, and some of them only three pens. If they fit up enough animals to fill five pens, which is a very moderate demand, and then it turns up that we have to prorate these pens in order to let everybody show, we will probably cut out some of the best stuff for the exhibit in this show. If you prorate one man you have to prorate another. You cannot draw the line. The only thing you can do is to cut down the large exhibitors, and some of the very best animals that show come from the class that occupy nine pens, and they justly deserve it. Not only is this true in one breed but in all breeds. I recall one herd of Berkshires that came here, and this particular herd never got below third place in any place they exhibited, and if your had prorated that man he would probably have left one of the very best animals he had at home, and if I were an exhibitor I should stay at home, if I had the stuff for five pens, and they wanted to take one or two away.

President Youngers: As I understand this, it does not strike out the word "nine," but leaves it with the discretion of the board whether it be nine or ten or more pens.

Mr. Rudge: I would like to ask Mr. Leonard whether it would be an injustice to an exhibitor if we changed the word to seven or six. Could not an exhibitor fill the class if they had six or seven pens?

Mr. Leonard: I do not think they could with less than nine pens. Ask Mr. Russell what he thinks of this matter.

Mr. Russell: We talked that matter over a number of times, and we cannot fill the class and take any decent care of the hogs with less than nine pens. I hope this board won't cut this thing down, because I have always lived in hopes that we would have 3,000 hogs on these fair grounds, and I have been making the state fair with my hogs every year. I have talked with a number of other men about coming to the Nebraska state fair, and they say they cannot come because they cannot get the pens they need. The time is coming when they can get pens, and some of the best breeders in Iowa come with a full herd all the way around, and if we get them to come here we will have to have the accommodations. They come to Iowa with a full herd and they could not split that up and come to the Nebraska state fair. I hope this won't be changed. I don't think you can get breeders in the hog department to fit up hogs if you prorate the pens and shut them off. I am not saying what I would do or would not do. You cannot say, you don't know what animals would be good animals to fit. This year you might be good on a line of aged boars and next year it might be sows.

Mr. Pritchard: Let me explain this motion of mine. I don't want to cut anybody out. That is the identical idea that I offered. In removing these words "nine pens," I want everybody here. The question is, have you the funds to build the pens? Now as to the other point. You make your entries February 1, or any other time before the fair that you want to. Every man that has a herd in the state of Nebraska cannot have the herd fitted at that time, but still he would like to know that he can get the pens. This matter is left at the discretion of the board of managers, and if they find that they cannot furnish the pens for part of the entries they will then act accordingly. You have 714 pens. This thing worked a hardship. Last year we had applications for 1,213 pens, with 714 pens to fill them with. It did work a hardship on a great many who would have brought their stuff here. If you will permit me to digress I will cite an instance. In 1902 or 1904 at the Iowa state fair Winn & Mastin brought in the most magnificent show hogs that I ever saw. They came into one class, sows one year old. Is it justice to the other breeders, when a man wants to bring in a carload or two of hogs, to build the pens for that man and shut out half the other breeders, as you did last year? No, it is not right, and we want every man who fits animals to be able to show them. My motion is to leave it with the discretion of the board, and if they furnish the pens for all the entries, all right, but in case they cannot do it, and have no money to do it with, not only in the hog department, but in every department, then I say limit the amount of pens.

Mr. Hervey: It seems to me that this proposition involves two conditions, one a matter of display and exhibition and the other a matter of education. We have two classes of people. We have one class whom we shall call expert exhibitors. They are the very men who will be at the head of that list of applications when the time comes for receiving applications. Those fellows will be the first fellows in, because they are professional exhibitors. From one year to another they are continually showing. They are always in shape, and exhibition is a part of their industry. There is another class of people we want to encourage if we want to carry on the educational feature. We want to encourage the fellows who buy stuff from the big breeders and establish a new herd. We want to give those fellows an opportunity in this state fair. They will be at the tail end of this list for applications, and are cut off year after year under the present conditions. It is to the interest of the state fair, and the state of Nebraska, and the live stock interests in general that we provide a means for taking care of those fellows. They are the men that we have to look after, and they are the men that need our assistance. These other fellows take care of themselves, whether they have the exhibit in Iowa, Kansas or Missouri or wherever they have to go. We are building up the industry here for the advantage of the state of Nebraska. That is what the state fair is for, and as long as we can make it for educational interests and carry on our work for the improvement of beginners we are serving the purpose for which we are organized. [Applause.]

President Youngers: In that case the proper thing to do would be to build more pens.

Mr. McLeod: Last year I could not bring my hogs here because the pens were all filled, but when I got here I found they were not all taken. If I understand rightly, they rejected any amount of bids for pens because they were taken. This is something this motion would have prevented if it had taken effect last year. As the president says, if we have not enough pens, why we ought to build more, and accommodate everybody if possible. Accept all these bids that come in for pens and then afterwards, if for some cause or other they cannot exhibit, probably at the end we would find that we had plenty without building. We may have to build a few, but believe the idea is a good one.

Mr. Cook: Along the line that the gentleman was talking: I believe that ordinarily we have pens enough to accommodate all the show hogs that may come to the state fair, but in years of prosperity, when we need more pens, I would be very much in favor of taking all the applications, and if we find we have not pens enough to accommodate them, build temporary pens, but there will be many years that the cholera and other things will come in and cut down the show, and then our pens will be sufficient to carry all the exhibit, but there is nothing that encourages the state fair management and makes the department favorable in the eyes of every one that comes as much as to have it running to overflow, and we can go and rent lumber and accommodate the overflow in these years that it is necessary to do so. I think this year you will find that we have ample space. If we go hedging about and discouraging many from asking for pens, and come up some years with about three barns full, you can see what a frost it would be. Let everybody come and we will make room for them. [Applause.]

Mr. Leonard: I would like to make an explanation as to why there were some empty pens at the last fair. There were fifteen empty ones, and the parties that those pens were assigned to never notified me that they would not come to the fair, and as they had until 8 o'clock Monday morning to put the exhibit in place, I could not use the pens until that time. The state board has the money for those pens. I have never heard from those parties that applied from the time I got their letters until now, and have not yet. If the gentleman can formulate some plan to add to his suggestion that would compel a man to come and occupy the pens or notify the superintendent if he could not do so I think it would be along the line to fill those pens.

Mr. McArdle: I cannot see where this motion would work a hardship on any man. It has not yet been explained to me where by cutting out the word nine and placing it to the discretion of the board of directors would work a hardship. I would vote against it if it would, as I do not want to work a hardship on any one. I believe this fair is an education, and without the men who have been making the exhibit time after time it would be a pretty poor show, but cannot see where this motion would work a hardship.

The motion was seconded and carried.

Mr. Hendershot: I would suggest that entries for hogs should close thirty days prior to the fair, in order to give the board of managers a chance to provide for the hogs in case we have a big exhibit and it will be necessary to build temporary pens. The entries should be made by a specified time so the management would know what to expect and what to do.

Secretary Mellor: I move that the entries of the swine department close July 1st. Seconded by Mr. Hendershot.

President Youngers: Gentlemen, you have heard the motion. Are you ready for the question?

Mr. Hervey: I do not favor that at all. It would work against the interests of the fair in getting a full exhibit possibly. It won't hurt the professional exhibitor. He will make his entries all right, but the very class of people I was advocating a while ago. We have any amount of men who don't know what kind of a proposition they are going to get into if they make the entries way in advance. I believe in holding the entries open as long as possible and giving every man a chance to get into the state fair who has the stuff and the disposition to come here, and if you make a specified time for the closing of entries, make some provision whereby additional pens could be supplied.

Secretary Mellor: I would like to ask Mr. Leonard how many applications for pens he had after July 1st.

Mr. Leonard: I could not tell you just now, quite a number.

Secretary Mellor: I have a letter in my office from Mr. Leonard stating that he had 1,200 application in May, and that is the reason that I made this motion July 1st as I thought it was after the time that people made applications for pens.

Mr. Leonard: I don't think that would be a wise rule. There are a number of cases that people wish to come here and never think to make their entries until 10 days before they come. There were applications for pens this year after I came to the grounds. At one time there were several applications cancelled, and I had a lot of pens on my hands and nobody to fill them. I wired two or three different parties in our own state and finally sent to Iowa and got a lot of white hogs. If you make that rule, there might be some times when we will have to deviate from the rule. If you can keep people from cancelling their orders we can make this thing all right.

Secretary Mellor: I would like to withdraw that motion.

Mr. Pritchard: Would it not be a good idea to limit the time that a man has to withdraw his money, say 15 days before the fair if you wish to make it. If a man does not withdraw within specified time, he cannot claim his money.

Mr. Leonard: I would like to make one statement in regard to the way I did this business. In February I had promised 865 pens and we had 714. I promised the balance on the supposition that some of these people would cancel. I did not notify them that that was all we had. I notified them that we could give them up to 865. It looked like I might have my foot in it. At that time I only knew I had thirteen barns, and did not know that I would have the other seven barns.

Mr. Haws: I seems to me that this could all be fixed up. Last year I noticed in looking over the fair grounds an overflow in the horse and cattle departments. I notified the association and in less than ten hours they reported forty or fifty extra stalls to take care of the stock. I am in favor of putting up all the pens they can fill. Let us pay on the lumber or buy it if necessary. I don't think it right to turn any one down, we can take care of them.

President Youngers: Are there any further questions on the revision of premium lists?

Mr. Pritchard: As I suggested last evening, the President should be added as a member of the board of managers, and also that the secretary of this association become a member of the board of managers. It looks very strange to me, gentlemen, that the president of this association whom we elect here can preside at this annual meeting and have a voice in case of an emergency, but when it comes to the board of managers, he calls them to order and he "kinder" keeps order, but when it comes to any questions, the board of managers simply say to the president, "What do you say about this thing?" he has no voice whatever except through the courtesy of the board. If you happen to get some mean fellow on that board and get into a scrap, our president and secretary who understand all the internal work of this affair, who have practically built it up and made it, it seems to me that if somebody would simply say to them "What have you to say about it?" it is a pretty poor state of affairs, and I would make a suggestion to this effect that the president shall preside at the meetings of this association and of the board of managers, and that he shall be a member of both of those, not as it is now where he simply presides without having a voice, but that he shall be a member of the board, and the same courtesy be extended to the secretary. I simply express the sentiment I feel in regard to this matter, or will make it a motion that the president and secretary be named actual members of the board of managers. Motion seconded.

Mr. McArdle: Would it not be a good suggestion to change the constitution (reading that section relating to board of managers)?

President Youngers: I think that in a matter of such importance it should be reduced to writing and be definite before it is adopted.

Member: My understanding of ex-officio member of the board is one who has full power to vote. Why could you not say if you desire in appointing board of managers president and secretary, ex-officio with power to vote.

Mr. McArdle: I think my suggestion covers all without any change.

Mr. Mellor: I think I can expedite this matter by making a suggestion of the insertion of the following words: In Constitution and By-Laws, under President, section 6, have it read: "It shall be the duty of the president to preside at all meetings of the board '*and board of managers.*'" Then after the words "he shall, at each annual meeting in January, appoint '*five additional members on the board of managers, no two of whom shall be from the same county; designate a chairman to act in his absence.*'" Under the heading of secretary, section 9, after the words "It shall be the duty of the secretary to keep his established office at Lincoln" insert "*he shall be a member of and record the proceedings of the meetings of the board and board of managers.* Under board of managers in section 11, begin with the following words: "*The president, secretary and the five managers selected by the president shall be the board of managers.*" And in the section relating to the compensation of the board of managers, state the amount that is annually appropriated as compensation for the board of managers, after which insert the words "*other than the president and secretary.*"

The motion as amended is seconded and carried.

Mr. Bassett: I would like to read some recommendations which the premiums revision committee desire to make.

RECOMMENDATIONS.

We respectfully submit the following recommendations:

Under present arrangements the secretary acts as superintendent of concessions; the duties of the secretary's office during and for some days just previous to the opening of the fair, are so numerous and exacting that it is not possible for him to give that careful and necessary personal supervision which the importance of a department would seem to demand, which makes 269 separate contracts on the part of this board and collects, as the financial report shows, $9,047.25, or 14 per cent of the total fair ground revenue for the year; the result is that just previous and during the fair, it is necessary for the secretary to intrust this department to employes whose whole time and effort is given up to making contracts, locating concessions, and collecting the money due on contracts, duties which are strenuous and exacting, and given no time for supervision which is most necessary in so important a department.

It is therefore recommended that there be appointed a superintendent of concessions; that the secretary act as assistant superintendent, conducting the necessary correspondence when the department does not require the full time of the superintendent.

President Youngers: Gentlemen, you have heard the report. What will you do with the recommendations of the committee?

Mr. McArdle: I move that the report be adopted. Seconded by Mr. James.

Mr. Rudge: I think that a little error crept in there. Why make the secretary assistant? Why not appoint an assistant? Nine-tenths of these contracts are made before the last ten days of the fair with the man who is in charge out there, and it seems to me that if the contracts are all made under the supervision of the secretary as in the past, just put in there that we appoint an assistant superindendent of concessions, or we will leave out the word assistant, for secretary. Leave it the same way as it is in the implement department. The secretary looks after it until the superintendent comes down and takes it.

Secretary Mellor: I don't know whether I quite like the wording of that recommendation or not. Not that I would not like to get out from under this concession load. When you realize that this department at the last fair brought in 14 per cent of the gross revenue, amounting to $9,047, as against about $4,000 under the superintendent plan, you will notice that we have not been making many steps backwards in the concessions department. I have had under me two young men for several years as assistant superintendents of concessions, Mr. E. H. Clark, purchasing agent of the University, and Mr. A. J. Johnson. These men have worked to the best of their ability and with satisfaction to me. There is no man on earth who can tell from some of the concessionaires' statements, in letters, asking for a concession, just whether it will be clean and meritorious or not. Of course the board of managers reserve the right to put any show off the grounds when not considered decent. As a usual thing some member of the board of managers has passed on these shows. I feel just as bad as any man in this audience about the fakes which seem to be only for the purpose of securing the people's money. I think that until we provide shows of our own we shall have this condition to contend with. Mr. Bassett tried to have clean shows when he was superintendent of concessions and I have tried it, and from such experience know that any other man taking hold of this department will fare just the same. I have no objection to the appointment of a superintendent of concessions, it would relieve me of a great load, and if you have one I hope it will benefit this association, but I doubt it.

In the past we have had some superintendents who have not been a benefit to the financial interests of this board. We have had nearly as much money collected proportionately in other years as we had this year, but we have never had a proportionate percentage from this department. In speaking of the contracts issued, I doubt if it is advisable to permit the issuance of so many during the coming year. I think it would be to the best interests of the department to allow a certain number of concessions in certain classes. I was going to take the matter up in this meeting, but under these recommendations thought possibly it was not my duty to speak of it. If the board, in their wisdom, sees fit to order the appointing of a superintendent of concessions, I hope he may limit the number even though not securing so great an amount of money, but rather catering to the satisfaction of the concessionaire as well as the people.

Mr. Bassett: As the criticism comes up I appreciate those facts. The idea was, that the secretary's office being here in Lincoln, he could conduct the correspondence. I believe he will bear me out in the statement that the heaviest work will come two weeks before the fair and during the fair.

Secretary Mellor: There were 151 contracts written before the 27th of August, and 261 contracts written altogether.

Mr. Bassett: I am willing to strike out the "assistant superintendent" and let the secretary conduct the business.

Mr. Haws: If we adopt the recommendations of the committee in regard to charging the cost in some other department, why it would still increase the importance of the concession department. I am in full sympathy with leaving the work in the scretary's office at Lincoln to conduct the correspondence until such time as it will demand the supervision of some one person.

Mr. Ollis: I don't like dividing this thing up between two men. If you are going to have a superintendent of concessions, don't fix it that the secretary carry it until a certain time and then change.

Mr. Rudge: I move that we cut out the word assistant.

As there was no objection, it was ordered that that portion be stricken out, "that secretary shall be assistant superintendent."

Mr. Bassett: (Reading from copy) and that president appoint a superintendent of concessions.

President Youngers: We have adopted that as we pass upon it.

Mr. Bassett: Article 6 has been covered by the secretary's talk, so I will not read that.

Mr. Haws: I would like to ask Mr. Bassett whether that recommendation calls for a charge to be made for space. While I think that we ought to get something, I do not think that we ought to put a figure on it at this time. It ought to be left in the hands of the board of managers, and if they think best, why they can make the charge.

Mr. Keedle: If we adopt the report, it shall be so.

Mr. Haws: While I believe that we ought to have a revenue from the grounds, it is a question we want to look into carefully, and I would like to have that optional with the board of managers and not make it final.

Mr. Bassett: You could make a nominal charge, Mr. Hendershot. In the buggy department one of those men told me he sold 400 buggies on the fair ground. The machinery exhibit is a harvest for those men. We don't get a cent of the revenue, not only that, we furnish the people and we furnish the opportunity, we advertise and we furnish them free admission to the grounds and we furnish police supervision, etc., then why in the name of common sense should they not contribute? Let me illustrate an injustice along that line. A friend of mine called my attention to the fact that he paid $50 for a tent in which to exhibit hand separators. He learned afterwards that the man adjoining him did not pay anything at all. He was selling buggies. They were both manufactured articles and he could not understand how it could be so. It was true, and it appeared that the reason for this was that between the two tents was the line of concessions and a street. Why should a man who exhibits dairy machinery we will say or something of that kind and another man in the same class of business—manufactured articles—not pay anything.

Mr. Rudge: Would the other man not have to pay if he were within the concession ground?

Member: I admit that, but it ought all to be concession ground. A man who comes on our ground and is benefited should contribute.

Secretary Mellor: In relation to this matter of $50. The ground alongside the Mercantile Hall is marked off for concessions and we sell it $2 the front foot. This man wanted twenty-five feet. I said at the time, "Do you want to go on the machinery ground or on the concession?" I showed him the ground and he said he would pay $50 for the concession ground. Some people made objections, but I did not know that he objected, as he did it of his own free will. It is the same man the gentleman has referred to. He did not want to go where the free ground was.

Mr. Haws: There are some people showing at our fairs, such as cream separators, who object to going on the free ground. They claim they don't get the class of people they want to get. They want to get around the dairy business, and they ought to pay for that and are willing to pay for it. The machinery men ought to pay a little. Of course we must consider that these men come here at a great expense. It is enormous, and while it is true that we furnish the opportunities, you take the machinery off your grounds and you have a great big vacant spot. They furnish all the accommodations except the grounds. In Classes A, B and C you can divide the barns at a nominal rental and you can take in a nice lot of money and they will be glad to pay it. I am in favor of doing what is to the best interests of the society, but I don't want this made a rule binding upon the board of managers to force it. I don't like it.

Mr. Rudge: In regard to making the ground all concessional ground. I think it is taking a step in the right direction. For several years I have been in favor of charging for space around Mercantile Hall, dairy building or poultry buildings where goods placed on exhibition are for sale, and I think that the same can be arranged for at a minimum price to start in with on the machinery grounds. For instance, if a man has the first corner there it is worth more than way down at the other end, but believe the price should be minimum and not make it large enough to cut those people out, but give them a pro rata price according to location.

President Youngers: If there is no objection to this as read it will be adopted.

Mr. Cook: What would you do with the men who already have permanent buildings?

Mr. Rudge: I think the men who have permanent buildings have a five year lease. A man who has a five-year lease would be exempt from any ground rent as long as that lease was in force.

Mr. Cook: It seems to me that after our patrons had looked at the stock and the other exhibits, there comes a space in the day when many of them have to be entertained. Some of them go to the race track. Many of them go about the machinery and are entertained there and stay there. Hundreds of them are entertaind in this way and we ought to realize that these men come here at a great expense and put up that machinery and make the wheels go around. They furnish part of the entertainment for the visitors upon our ground. When the time comes that we can put up the machinery hall as the superintendent has said, then they will gracefully and willingly pay, but when we ask them to go under the canopy of heaven and take their chances on wind and storm, we ought to be fair with them, as they furnish a lot of the entertainment. You take away the machinery out of the center of the grounds, and we would feel very much as the fellow did who did not have his dinner.

Mr. Hervey: I move the adoption of that recommendation. Mr. Russell seconded the motion, and same was carried.

Mr. Bassett: "That the board of managers shall appoint at the time of each fair, a committee of three persons, whose duties shall be to extend the courtesies of the state board to visiting officials of other state fairs and prominent citizens of this and other states."

Secretary Mellor: Heretofore we have always referred that part of the business to the president, and I think it ought to be the president's duty to appoint any one to take charge of the visiting officials. I move that the word "president" be substituted for "board of managers."

Mr. Bassett: I accept that.

Mr. Pritchard: We know that thing, and if any one should extend the courtesy to visit these people, it should be the president of this association. I move that the following words be inserted after the word "persons" "*of which the president shall be chairman.*"

Secretary Mellor: I second the motion. Motion carried.

Mr. Bassett: I make it as amended, "of which the president shall be chairman." (Reading) that the board of managers be authorized to accept, comply and approve with the provisions of special premium offers

President Youngers: As there is no objection to this amendment, it is adopted. We will proceed with the reading.

Mr. Bassett: It is suggested by your committee that the officers and employees of this board are insufficiently paid for their services; that speed premiums be left with the board of managers.

Mr. Hendershot: I move that the board of managers be instructed that all fake shows shall be kept from the grounds as far as possible.

Mr. Ollis: I would like to amend that motion by substituting the following: That it is the sentiment of this board that all shows should be of a clean and educational nature, and the board of managers are requested to use due care in the granting of concessions. Motion was seconded and carried.

Mr. Bassett: Ex-presidents of the Nebraska State Board of Agriculture who are not now members will be the guests of this board on Thursday of each year of the fair.

Mr. Bassett: One thing occurs to me. It seems to me that instead of having our annual meeting at 4 o'clock on Tuesday, we ought to meet at 2 o'clock. We could have more time for the consideration of matters. I have looked up the statutes and there is no provision fixing the time. It simply says the third Tuesday in January and says nothing about the hour, I move that the by-laws be amended to read 2 o'clock instead of 4. Motion seconded and carried.

Mr. Graham: I move that this body adopt this report as read and amended.

Mr. Rudge: I want to call your attention to the suggestion that was made by the committee at the last end of their report, and also to the recommendation made by the president in his report, and that was with reference to the salary of the secretary. I also think that there are some other salaries here that should have some increase. I am not speaking for myself, salary does not cut any ice with me, but I am speaking for the men who are obliged to come here from other cities and put in their time, and of course in the past years we have not been in a position to pay them. We were just getting out of the woods, but today we are in a position to pay them, and I think we should pay these men somewhere near what their services are worth. You can take it from the board of managers' report, and you will find that these men have been called here fifteen times during the past year, outside of the two weeks put in here during the state fair, and there are very few of them that do not lose something by coming here fifteen times during the year. They stay two days at a time, making thirty days and the two weeks they are here during the state fair makes 45 days. It is very inconvenient for a lot of these men to come to these meetings at times, but they do come anyhow and to a great loss of time and their own interests, and I don't think you pay your board of managers what you should pay them, and I don't think that you are paying your superintendent what you should pay him, and think there should be some increase on these salaries, what the increase should be is for you to determine. There should be an increase in your secretary's salary. You are paying the same as you did ten years ago, and there is three times the amount of work done now than there was at that time, and the secretary has to put in all of his time at the work. Ten years ago probably half or a third of the secretary's time was given to the work. If you were paying too much then, why all well and good. I don't think the services we are getting now are amply paid for, considering the cost of living in Lincoln. I know quite frequently a member comes in and the secretary takes him out to dinner. There is no charge made for this in the expense account. I think that you ought to increase the salaries of your secretary, the board of managers and the superintendents.

Mr. Graham: The motion that is before the house is the adoption of that report, and its adoption includes the suggestion that these salaries should be increased. Then comes the question of how much. My idea would be that a committee be appointed for the purpose of seeing as to how much the increase should be and report to this body for action.

President Youngers: I think this is a point well taken and we should dispose of the question of the adoption of this report as amended and read. Are you ready for the question? Motion was carried.

President: We might as well settle this question in open house, if it is agreeable.

Mr. Haws: I fully realize that the secretary is not getting nearly what he ought to get or what the secretaries in other states are getting, and realize that we are not in a position to pay as much as we would like to, but believe that we should make a substantial increase, and I

Move that the secretary's salary be raised to $2,400, and that article 91 be amended to read $2,400.

Secretary Mellor: I would like to say something. I don't know that I will be elected secretary. We have kept an accurate account this last year of how much it cost us to live in Lincoln. The secretary has to make a good many trips that he don't get anything for. It has cost me more than my salary this past year to live here. I have something to draw from, but the question is, shall I continue to draw on this. Is it right for me to do this, or right for you to ask it of me, or for you to ask it of any other secretary?

Mr. Keedle: I would amend that motion to read $3,000.

Mr. Bassett: We don't pay the governor of the state $3,000 and I don't approve of making this more than $2,500.

Mr. McLeod: I believe if we furnished the secretary all that is furnished the governor he would be satisfied with $2,000.

Mr. Hendershot: I should like to have a rising vote on this question. I would be glad to compromise on $2,500 and would like to have our friend make the motion to that effect. I don't think the people would indorse a raise of $1,000. I believe I stand as close to the secretary as any one, and would do as much for him, but I don't believe such a raise as that would meet with the approval of the people of the state of Nebraska.

President Youngers: A rising vote is called for.

Mr. Pritchard: There is one thing you must think of, and that is of going before the legislature and asking for the appropriation. While I would be glad to see our friend get $3,000, and his office is of more importance than the governor of the state according to the amount of work he does, but you have to be careful in this matter on account of going before the legislature.

Mr. Haws: I was going to make the motion as a matter of compromise to be $2,500. That is not enough compensation for the work, but my idea is exactly along the line of going to the legislature and asking for the appropriation.

President: The only way to do that would be to recommend it.

Mr. McLeod: Along that line of being afraid of the legislature. They voted $3,000 for the railroad commissioner and he does not perform nearly the work that the secretary does, and if they thought it all right to pay him that, they could find no fault with paying the secretary $3,000.

Mr. James: The by-laws may be amended by a vote of two-thirds of the membership present at an annual meeting.

After some discussion the motion was lost.

Mr. Haws: I move that the secretary's salary be raised to $2,500.

After discussion the motion was carried, and secretary's salary raised to $2,500 per year.

Secretary Mellor: I move you that the amount set apart for board of managers be $1,250.

Mr. Bassett: I would amend that motion by making the amount $1,500. Mr. Bassett's amendment was seconded by Mr. McArdle and motion as amended was carried.

Mr. Rudge: In my opinion the treasurer should receive the same as a member of the board of managers, and I would like to see Mr. Russell get the same amount. He does not attend the meetings of the board of managers, probably only once or twice during the year that he comes, but he puts in ten days at the time of the fair and of course he has to make out his reports. I would move that you increase his pay to $250, and that would be adequate pay in proportion to what you pay your board of managers.

Motion was seconded and carried that treasurer receive $250.

Mr. Mickey: I move that the compensation of the various superintendents of the board of agriculture be left with the board of managers with power to act. Motion seconded and carried.

President Youngers: Is the committee on nominations ready to report?

Mr. Ollis: I would like to know how long the majority of the present members have been members of the board. I think there is an idea out that when a man gets on the board he stays there a lifetime, and most of them have been there a long time. I believe it would be well to explain this matter so that everybody can go home understanding it.

Secretary Mellor: In answer to your question, Mr. Ollis, I will read from our 1905 report at page 229, in the article entitled "A Short History of the Nebraska State Board of Agriculture," in which, at the top of the page, under members elected 1894, will be found among the present members only the names of Mr. S. C. Bassett and Mr. L. Morse, both of whom were first elected at that meeting and are now our oldest members. In 1896 Mr. Chas. Mann was elected and in 1897 Mr. Elijah Filley. Mr. Peter Youngers and myself, the oldest members now holding official positions, began our duties on this board of managers in 1900, Mr. Bassett then being president, which was the first year you held a fair on your return from Omaha to Lincoln. There is some inclination to criticise this board as being a "perpetual body," but I am sure that if a person inclined to that belief will carefully study the history of our membership they will arrive at a conclusion that such an idea is erroneous, for the change in membership is quite marked, and a member must be considered as efficient and useful to this board to sustain long membership. I am glad this question has been brought up, as I am sure that a full understanding of the facts will only result toward the welfare of the State Board of Agriculture.

President Youngers: Is the committee on nominations ready to report?

REPORT OF COMMITTEE ON NOMINATIONS.

To the Nebraska State Board of Agriculture, Greeting:

Your committee on nominations, after giving due consideration to the geographical location and interest manifested by the different counties presenting candidates for nomination on the state board of agriculture, wish to report the following names:

J. D. Ream, Custer Co., Broken Bow.
H. R. Howe, Nemaha Co., Auburn.
W. F. Johnson, Clay Co., Harvard.

Chas. Mann, Dawes Co., Chadron.
V. Arnold, Richardson Co., Verdon.
S. C. Bassett, Buffalo Co., Gibbon.
Geo. F. Dickman, Seward Co., Seward.
W. R. Mellor, Sherman Co., Loup City.
Peter Youngers, Jr., Fillmore Co., Geneva.
G. W. Hervey, Douglas Co., Omaha.
Joseph Roberts, Dodge Co., Fremont.
Wm. Foster, Lancaster Co., Lincoln.
R. M. Wolcott, Merrick Co., Palmer.
E. Z. Russell, Washington Co., Blair.

All of which is respectfully submitted.

I. W. HAWS, Chairman.
M. F. O'MALLEY.
L. K. McGAW.
WM. JAMES.
RALPH SEARLE.

On motion the report of the committee was adopted and the aforesaid named persons declared duly elected as members of the State Board of Agriculture for the coming two years.

Mr. Mickey: I move that in case the board of managers found a probable omission, or an item in the premium list which demands correction, they be empowered to correct them.

Motion seconded and carried.

Mr. Keedle: I believe that we are about through and I move that we proceed to the election of officers by ballot.

Motion seconded and carried.

The president appointed the following men as tellers: Messrs. Dickman, Pritchard and O'Malley.

Mr. Lewellyn: I take pleasure in placing in nomination for president of this association, Mr. C. H. Rudge. Mr. Keedle seconded the nomination.

Mr. Mickey: I move that the rules be suspended and the secretary be instructed to cast the unanimous vote of this meeting for Mr. C. H. Rudge as president. Mr. Filley seconded the motion.

Secretary Mellor: It is my pleasure to cast the unanimous vote of this meeting for Mr. C. H. Rudge as president.

President Youngers: I declare Mr. Rudge elected president for the ensuing year.

Members: Mr. Rudge.

Mr. Rudge: It goes without saying that an honor of this kind is certainly appreciated by anyone, and I want to say that it is appreciated by me, for I know that in putting in a man as the president of the State Board of Agriculture, you aim to put a man in in whom you have confidence, and you aim to put a man in who you think has some ability along the line of state fair work. I don't claim to have all this ability. I have done the best I could in helping to build up this fair, and am glad to know that you appreciate it. I certainly know that in conducting a state fair there are three classes of people to accommodate or to entertain. The first class is the exhibitor. We have to provide and entertain our exhibitors. We have also another class who attend our fairs and that is a class of men and women who come for the instruction they receive at our state fairs. And then we have a third class who come for the entertainment aside from the instruction they receive, so that in appointing a board of managers and selecting your officers you have to select men who are broad minded and men who I think will see to it that all these different classes are taken care of. I want to thank you for the honor bestowed upon me. I won't say that I will do better than I did last year, but I will do my best that the 1908 fair may be the greatest we have ever had. [Applause.]

Mr. Hendershot: I wish to present before this honorable body a man for the office of first vice president, which I consider a very important office, because sometimes our illustrious presidents are indisposed, and when they are we need such men as Mr. Rudge to take their place. I have the honor to nominate Mr. Hervey.

Mr. Mickey: I move that the rules be suspended and the secretary be instructed to cast the unanimous vote of this meeting for Mr. Hervey as first vice president.

Secretary Mellor: It gives me additional pleasure to cast the full vote of this body for Mr. Hervey as first vice president of the Nebraska Board of Agriculture.

Mr. Hervey: Gentlemen, I don't want to take up your time in making any remarks, as the time has already been consumed, but I thank you very cordially for this honor you have extended to me. [Applause.]

Mr. Bassett nominated Mr. Vincent Arnold as second vice president. Mr. Hendershot seconded the nomination, and moved that the rules be suspended and the secretary instructed to cast the unanimous vote of the meeting for Mr. Arnold as second vice president.

Motion carried and Mr. Arnold declared elected.

Mr. Foster: I take pleasure in nominating Mr. E. Z. Russell to succeed himself as treasurer of this body, and move that the rules be suspended and the secretary instructed to cast the vote for Mr. Russell as treasurer. Seconded by Mr. Rudge.

Secretary Mellor: It is always a pleasure to cast the full vote of this body for Mr. E. Z. Russell as treasurer, who is entirely competent to fill the office, and we therefore cast the full vote.

President Youngers: I desire to state that Mr. Russell is elected treasurer for the ensuing year. [Applause.]

Mr. Russell: I certainly thank you for your further confidence in placing me in this position again. I wish to assure you that my little mite will be extended in making the next state fair a better one than any yet if possible.

Mr. Dickman: I wish to state that no clearer or more concise statement could be made by anybody than has been made by your present secretary, and I take pleasure in nominating Mr. Mellor to succeed himself.

Mr. Keedle moved that rules be suspended and full vote be cast for Mr. Mellor as secretary. Motion carried.

President: It is so ordered, and I have the pleasure of casting the full vote of this convention for Mr. Mellor and announce that he is now elected secretary for the ensuing year.

Secretary Mellor: It is always a pleasure to any person to know that his efforts are commended. The words of Mr. Dickman in nominating me are very gratifying of course. It has been my effort to give you the best of my services, and hope in the future that I will receive the commendation for such services, the same as I have in the past, and I can assure you that I will do the best I can for the Nebraska State Board of Agriculture.

Mr. Hervey: I would like to make a resolution or two. The matter did not occur to me in time to get it into the hands of the committee on resolutions. I presume you know that the National Corn Show held their first show last year, and they are completely and thoroughly organized during the last six months. The management of this association is now looking for a location for holding their 1908 show. I took this matter up with the management two weeks ago and we have enlisted their sympathy and have had them down from Omaha and showed them the Auditorium building, and they passed on it as being much better than the building in Chicago. Besides we have taken the matter up with the Commercial Club, and we have not not heard from Mr. Holden and Mr. Jones who are at the head of this propostion, at the present time. Omaha has put up a guarantee of $50,000 in order to get that show in 1908 for the state of Nebraska. We presume, the condition that things are in, that there is no doubt that we will have a show at Omaha. I think in justice to the state of Nebraska, that the State Board of Agriculture should take some action in indorsing the prospect of what the people in Omaha are trying to do in this matter.

Resolved, That we, as members of the Nebraska State Board of Agriculture, in annual convention assembled, heartily indorse the action of the Commercial Club of Omaha in its present efforts to secure the holding of the National Corn Show for 1908, in that city; and that we pledge our support and influence in so far as lies within our power as an interested state organization, and as citizens of Nebraska interested in the improvement and development of the corn growing industry of the country to make this show the greatest and best exhibition of this cereal ever held in the United States.

Mr. Hervey: I would move the adoption of this resolution. Motion was seconded and carried.

Mr. Hervey: I have another resolution to offer, which needs a little explanation. We have an organization in Colorado known as the "Western Live Stock Show." It comes at a season of the year which doesn't conflict with other live stock shows of the United States, and the breeders are interested in it because it is a great source of advertising. People come from all over the country—from Texas and from the Canada line—people come there to see this show, and it is being held this week. Formerly when they first commenced, it was held next week, but they have inadvertently taken our week. I think a little resolution explaining this matter to those people would be in place, and get them to make it next week or last week so as not to interfere.

RESOLUTION.

In view of the fact that there is now being held in our sister state to the west of us, Colorado, what is known as the Western Live Stock Show, and in conjunction with this, in the city of Denver, the annual meeting of the American National Live Stock Association, in both of which a large number of the leading breeders and stock men of our state are greatly interested, and desire to attend, and owing to the conflicting dates of these meetings with the convention week of Organized Agriculture in Nebraska, which prohibits their attendance at both these points, therefore, be it

Resolved, That the Nebraska State Board of Agriculture, in annual meeting assembled at Lincoln, this 22d day of January, 1908, do hereby ask that the officers of these western associations be informed of this conflict of dates and that some arrangement be made, if possible, to remove this condition and thus better serve the interests of all concerned.

It may further be explained that the dates in use now by Organized Agriculture in the convention week observed by Nebraska are established by an act of the state legislature governing the annual meeting of the State Board of Agriculture, and that the present condition of the organization known as Organized Agriculture in Nebraska, and in which there are twenty state associations represented, has been in existence for eight years.

By motion the resolution was adopted.

Mr. Cook: Complaints have come in here by many that transportation facilities to the farm have been very meagre during this meeting and would like to offer a resolution to show that this body has taken notice of it.

Whereas, At a time when the city of Lincoln is favored with the meetings of Organized Agriculture, which bring to the city hundreds of visitors to attend upon the meetings at the State Farm:

Resolved, That the Lincoln Traction Company, through its management, should anticipate the business that will be handled at such times and furnish sufficient cars to handle the crowd and put on a five- or ten-minute service during the day of said meeting.

By motion this resolution was adopted.

President: I would like to announce the following:

WEDNESDAY EVENING.

Democratic Tendencies in Education....President A. B. Storms, Ames, Ia.

THURSDAY EVENING.

Illustrated Lecture on Corn Improvement..........................
..........................A. D. Shamel, U. S. Dept. of Agriculture

FRIDAY EVENING, 8:00 TO 9:30.

Reception to all members of State Agricultural Societies, by Governor and Mrs. Sheldon, at the Governor's Mansion, corner Fifteenth and H Streets.

Mr. Rudge: I would like to submit the following as the Board of Managers for approval: H. L. Cook, chairman, Howard county; G. W. Hervey, Douglas county; O. P. Hendershot, Thayer county; Peter Youngers, Fillmore county; I. W. Haws, Kearney county.

Mr. Bassett: I move that this report be approved. Motion seconded and carried.

President Youngers: All in favor of receiving the report of committee on recommendations and discharging same, say Aye. Carried.

Mr. Youngers: Gentlemen, this is Mr. Rudge, your new president. We wish him all kinds of success throughout the management and throughout life.

Member: I move that this body extend a vote of thanks to Mr. Youngers for his efficient services in the past. Motion carried by rising vote.

Mr. Youngers: Mr. Chairman, and Gentlemen of the Board of Agriculture, I can assure you that I appreciate this compliment, and would say that in the past I have worked for what I considered to be to the best interests of the upbuilding of the Board of Agriculture of the state of Nebraska, knowing no creed, no faction, no politics, but simply the upbuilding of this great association, and I assure you this vote of thanks is highly appreciated at this time. I shall do in the future as I have in the past, everything in my power to assist the work of this association. I thank you. [Applause.]

President Rudge: I think it necessary that the new Board of Managers meet in the secretary's office at 2 o'clock this afternoon.

By motion, meeting adjourned.

REPORT OF SUPERINTENDENT OF GATES FOR 1907

	C., B. & Q. Coupons — Whole	C., B. & Q. Coupons — Half	U.P. Coupons	U.P. Coupons —Half	C. & N. W. Coupons	Total R. R. Coupons	General Admission	Total Paid at Main Gate	Exhibitors	Concessionaires	Gate Checks	Ex-Officers and Members	Advertising	Press	Total at Main Gates	Amphitheatre	Press Amphitheatre	Total Tickets Taken
Monday	268	......	......	......	......	....	3091	3359	764	660	142	30	15	88	5058	505	9	5572
Tuesday..........	3154	......	......	......	......	....	9937	13091	1097	732	102	31	37	315	15405	4053	41	19499
Wednesday	7770	......	......	......	......	....	26265	34035	1106	1011	339	43	83	665	37282	9960	117	47359
Thursday	4783	......	......	......	......	....	23048	27831	1146	1100	315	46	61	622	31181	9497	110	40788
Friday	453	156	......	......	......	....	5752	6361	1023	900	366	35	22	260	8967	2567	74	11608
Total..........	16428	156				16584	68093	84677	5136	4403	1324	185	218	1950	97893	26582	351	124826
1906............	25704	313	3196	25	4068	33306	57510	90816	5088	3307	1872	1170	......	2010	104263	30985	......	135248
1905............	15957	313	2176	14	2606	21066	30730	51796	4676	2398	1480	1113	......	1637	63100	11508	......	74608
1904............	15793	243	1962	15	1990	20003	33192	53195	3823	1957	2223	2166	......	2265	65631	14712	......	80343
1903............	15775	......	......	......	......	15775	36396	52171	4480	......	4124	3433	......	4392	68559	15947	......	84506
1902............	14770	......	......	......	......	14770	31065	45835	4171	......	3404	3989	......	2899	59411	10889	......	70300
1901............	11582	......	......	......	......	11582	24139	35721	3950	......	2113	3357	......	2816	46985	9116	......	56101
1900............	14106	......	......	......	......	14106	19399	33505	3871	......	1663	2330	......	2360	43703	8001	......	51704

REPORT OF SUPERINTENDENT OF CLASS A.

Mr. W. R. Mellor, Secretary, Lincoln, Neb.

DEAR SIR: I herewith hand you financial statement and also diagram of barns showing 1907 occupation.

Every stall in the barns was used this year and paid for, together with twelve temporary stalls built outside. There were 170 horses on exhibition, I believe the largest exhibit ever made at the state fair in Nebraska, and it was thought by many who have been interested in exhibits, for a number of years, that the quality, as a whole, was the best ever shown here.

The horse industry in the state of Nebraska is making rapid strides. Many breeders of American-bred horses are becoming interested and are asking for an American-bred classification, which I believe should be granted by the State Board of Agriculture.

I am now conducting correspondence with the different horse breeders of the state with a view of acquiring information needed as to the changes which should be made in the 1908 premium list, and will embody the same with my recommendations in a report which I shall make soon to Mr. S. C. Bassett, chairman of the revision committee.

I am glad to be able to say that the business in my department was pleasant, there being no complaints made that I know of, and I think that all the exhibitors went home feeling well pleased with the way they were treated by the State Board of Agriculture.

I wish to thank, very kindly, the officers and Board of Managers for their support in conducting the business in my department.

Yours very truly,

J. A. OLLIS, JR., Supt. Class A.

FINANCIAL STATEMENT.

Frank Iams, 26 stalls	$52 00
Frank Howard, 8 stalls	16 00
Watson, Woods Bros. & Kelly, 38 stalls	76 00
North, Robinson & West, 19 stalls	38 00
Lincoln Importing Horse Co., 15 stalls	30 00
C. L. Floden, 1 stall	2 00
Peter Johnston, 4 stalls	8 00
O. P. Hendershot, 19 stalls	38 00
Rhea Bros., 14 stalls	28 00
J. M. Clark, 1 stall	2 00
Mousel Bros, 2 stalls	4 00
Diers Bros., 4 stalls	8 00
Harlan Parish, 1 stall	2 00

PONY STALLS.

O. P. Hendershot, 1 stall	$2 00
J. V. Stradley, 4 stalls	8 00
J. G. Conderman, 1 stall	2 00
Mildred Chapin, 1 stall	2 00
A. J. C. Robb, 4 stalls	8 00
Ed. Hughes, 1 stall	2 00
	$328 00
Paid W. R. Mellor, Secretary, September 5	328 00

J. A. OLLIS, Jr.

BARN No. 1.
North End.

36	Frank Iams	Frank Iams	
35	Frank Iams	Frank Iams	1
34	Frank Iams	Frank Iams	1
33	Frank Iams	Frank Iams	2
32	Frank Iams	Frank Iams	3
31	Frank Iams	Frank Iams	4
30	Frank Iams	Frank Iams	5
29	Frank Iams	Frank Iams	6
28	Frank Iams	Frank Iams	7
27	Frank Iams	Frank Iams	8
26	Frank Iams	Frank Iams	9
25	Frank Iams	Frank Iams	10
24	Frank Iams	Frank Iams	11
23	Frank Iams	Frank Iams	12
22	Frank Howard	Frank Howard	13
21	Frank Howard	Diers Bros.	14
20	Frank Howard	Diers Bros.	15
19	Frank Howard	Diers Bros.	16
18	Frank Howard	Diers Bros.	17

BARN No. 2.

Watson, Wood Bros. & Kelly Co. occupied all of barn No. 2.

North End.

36			
35			
34			1
33			2
32			3
31			4
30			5
29			6
28			7
27			8
26			9
25			10
24			11
23			12
22			13
21			14
20			15
19			16
18			17

BARN No. 3.
North End.

38	North, Robinson & West	Lincoln Importing Horse Co.	1
37	North, Robinson & West	Lincoln Importing Horse Co.	2
36	North, Robinson & West	Lincoln Importing Horse Co.	3
35	North, Robinson & West	Lincoln Importing Horse Co.	4
34	North, Robinson & West	Lincoln Importing Horse Co.	5
33	North, Robinson & West	Lincoln Importing Horse Co.	6
32	North, Robinson & West	Lincoln Importing Horse Co.	7
31	North, Robinson & West	Lincoln Importing Horse Co.	8
30	North, Robinson & West	Lincoln Importing Horse Co.	9
29	North, Robinson & West	Lincoln Importing Horse Co.	10
28	North, Robinson & West	Lincoln Importing Horse Co.	11
27	North, Robinson & West	Lincoln Importing Horse Co.	12
26	North, Robinson & West	Lincoln Importing Horse Co.	13
25	North, Robinson & West	Lincoln Importing Horse Co.	14
24	North, Robinson & West	Lincoln Importing Horse Co.	15
23	North, Robinson & West	Peter Johnson	16
22	North, Robinson & West	Peter Johnson	17
21	North, Robinson & West	Peter Johnson	18
20	North, Robinson & West	Peter Johnson	19

BARN No. 4.
North End.

38	O. P. Hendershot	Rhea Bros.	1
37	O. P. Hendershot	Rhea Bros.	2
36	O. P. Hendershot	Rhea Bros.	3
35	O. P. Hendershot	Rhea Bros.	4
34	O. P. Hendershot	Rhea Bros.	5
33	O. P. Hendershot	Rhea Bros.	6
32	O. P. Hendershot	Rhea Bros.	7
31	O. P. Hendershot	Rhea Bros.	8
30	O. P. Hendershot	Rhea Bros.	9
29	O. P. Hendershot	Rhea Bros.	10
28	O. P. Hendershot	Rhea Bros.	11
27	O. P. Hendershot	Rhea Bros.	12
26	O. P. Hendershot	Rhea Bros.	13
25	O. P. Hendershot	Rhea Bros.	14
24	O. P. Hendershot	Rhea Bros.	15
23	O. P. Hendershot	C. L. Flodeen	16
22	O. P. Hendershot	Mousel Bros.	17
21	O. P. Hendershot	Mousel Bros.	18
20	O. P. Hendershot	Harlan Parish	19

Ord, Valley County, Nebraska, January 13, 1908.

Mr. S. C. Bassett, Chairman, Gibbon, Neb.

Dear Sir: You will please find enclosed my report as to revising Class A of premium list.

Shortly after the fair I wrote to every man that exhibited at our last fair, as well as all those that had ever corresponded with me in regard to showing. In this letter I invited them to send me any suggestion or criticism they had to make. The answers to these letters, as well as my own experience in conducting the department, have all been considered in making my report. I think we should hold down the amount of premiums as much as we can, yet our state and its live stock industries are growing so rapidly that we have to recognize it in somewhat increased premiums. Our horse show has heretofore been almost entirely an importers' show, and I believe the demand for American-bred classes is so strong that it must be heeded. I don't believe that for this year at least the list I have suggested would cost any more than it has. I suppose there will be some kicking if we cut off the fourth and fifth premium, but I don't believe it would hurt our show in the least.

There is quite a clamor for additional barn room, but if the rule I have suggested as to number of stalls is adopted we will have barn room enough for two years, and it will greatly enhance the quality of our exhibit, and that is needed. We certainly don't want a lot of sale horses brought there. My correspondence shows that there are a lot of small breeders and importers that are now afraid to show six or eight horses, knowing that a few fellows will show a barn full, thus overshadowing them by numbers. I expect to be in Lincoln Monday evening and will see you at that time. I have made my report complete, so it is ready for the printer if it should be adopted. However, I am aware that yourself and other members of the committee have had much more experience in these matters than myself and only submit it for your consideration.

I am, sincerely yours,

J. A. OLLIS, JR., Supt. Class A.

SUGGESTIONS.

Rule 87. Not more than ten stalls will be awarded to one exhibitor for one breed of horses, and not more than fifteen stalls to one exhibitor in any case. Stalls used for animals not competing for a prize will be charged $5 extra, with the privilege of being excluded from grounds.

Rule 88. Exhibitors of pure-breds must show application for entry, name of animal, registry number, also exact date of birth as shown by registry certificate, and secretary shall show on entry card given exhibitor the name and date of birth of the animal entered. This card must in every case be exhibited with the animal when shown. This rule to apply to all animals over one year old. For animals under one year, if not registered, owner shall file affidavit of date of birth.

Rule 89. All animals competing in the breeding classes must be free from hereditary ailments. Animals will be passed on for soundness by a competent veterinarian to be appointed by the Board of Managers.

Cut out of the 1907 premium list Nos. 5, 10, 17, 29, 21, 34, 41, 46, amounting to $392; that will leave just $1,000; then duplicate the above for American-bred horses. (I don't believe the American-breds would draw out more than the $392.)

Lot 5.—Draft Geldings and Mares. (Pure-bred Mares barred.)

Gelding or mare, 4 years or over	$10 00	$8 00	$6 00	$4 00
Gelding or mare, 3 and under 4	8 00	6 00	4 00	2 00
Gelding or mare, 2 and under 3	8 00	6 00	4 00	2 00
Gelding or mare, 1 and under 2	8 00	6 00	4 00	2 00
Draft team in harness			$25 00	$15 00
Four horse team			25 00	15 00
Best team mules			25 00	15 00

The same animal not to be shown in more than one team. Soundness, size, symmetry, muscular development, quality of feet and legs and character of movement to be considered.

Animals shown in this class must be from pure-bred sires.

REPORT OF SUPERINTENDENT OF CLASS B.

To the Board of Managers of the Nebraska State Board of Agriculture.

Gentlemen: I herewith present my report as superintendent of cattle during the fair just closed. The exhibitors and the number of cattle shown by each are as follows:

SHORTHORNS

Geo. Allen & Son, Lexington, Nebr.	6
Easton & Hendershot, Hebron, Nebr.	14
Thos. Hunt, Blue Rapids, Kan.	1
Thos. Andrews, Cambridge, Nebr.	9
A. C. Shallenberger, Alma, Nebr.	12
W. R. Holt, Falls City, Nebr.	3
Dr. J. G. Brenizer, Broken Bow, Nebr.	11
Edw. Schuler, Verdon, Nebr.	1
C. G. Nootz, Raymond, Nebr.	11
Bellows Bros., Maryville, Mo.	12
A. F. Graves, Maryville, Mo.	3
J. T. Judge, Carroll, Iowa.	8
T. K. Tomson & Son, Dover, Kan.	12
Robt. Guthrie, Lincoln, Nebr.	12
Retzlaff Bros., Lancaster county, Nebraska.	11
J. R. Mansfield & Sons, Wisner, Nebr.	5

Howell Rees, Pilger, Nebr	2
Aug. Schroer, Havelock, Nebr	3
Geo. Stabler, Havelock, Nebr	1
H. K. Frantz, Havelock, Nebr	4
G. H. Hasebrook, Bladen, Nebr	5
S. A. Nelson & Sons, Malcolm, Nebr	17
G. A. Bailey, Kearney, Nebr	2
W. J. Hather, Ord, Nebr	1
G. H. Hart, Summerfield, Kan	7
G. H. White, Emerson, Iowa	7
C. F. Mitchell, Emerson, Iowa	2
H. C. Luckey, Bethany, Nebr	3
C. A. Hill, Trumbull, Nebr	1
Geo. F. Dorsch, Cook, Nebr	3
John O'Kane, Wisner, Nebr	1
Owen Kane, Nebraska	1
Total	201

HEREFORDS

W. N. Rogers, McCook, Nebr	18
Mousel Bros., Cambridge, Nebr	15
J. E. Logan, Kansas City, Mo	10
E. R. Morgan, Blue Rapids, Kan	14
J. G. Von Seggern, Wisner, Nebr	9
E. N. & A. L. Allen, Arapahoe, Nebr	6
G. P. Darwin, Virginia, Nebr	1
Total	73

ABERDEEN-ANGUS

Christian & Lang, York, Nebr	11
Paul Thompson & Sons, Benson, Nebr	10
Oliver Hammers, Malvern, Iowa	9
D. N. Syford, Lincoln, Nebr	6
H. L. Cantine, Quimby, Iowa	1
McDonald & Brantley, Princeton, Mo	12
Total	49

GALLOWAYS

Straub Bros., Avoca, Nebr	17
G. W. Lindsay, Red Cloud, Nebr	14
A. G. Abney, North Loup, Nebr	12
Total	43

RED POLLED

G. P. Schwab & Sons, Clay Center, Nebr	15
Chas. Graff, Bancroft, Nebr	9
S. McKelvie & Son, Fairfield, Nebr	5
Frank Davis, Holbrook, Nebr	13
E. R. Wileman & Son, Woodruff, Kan	13
Total	53

POLLED DURHAM

Jas. Wilson & Son, Avoca, Iowa	12
G. A. Bailey, Kearney, Nebr	7
W. J. Armstrong, Elgin, Nebr	6
Wm. Smiley, Albany, Wis	16
M. Yoakem & Son, Webster, Iowa	14
Total	55

JERSEYS

Hunter & Smith, Beatrice, Nebr	16
H. C. Myers, Lincoln, Nebr	8
Honeywell & Reedy, Lincoln, Nebr	14
W. W. Bute, Lincoln, Nebr	2
Compton & Allam, Lincoln, Nebr	2
Total	42

HOLSTEIN-FRIESIAN

H. A. Gabbey & Son, Pawnee City, Nebr	8
J. C. Doubt & Son, Lancaster county, Nebraska	12
Total	20

STEERS

Mousel Bros.	2
A. C. Shallenberger	2
J G. Lindsay	1
M. M. Sterns	1
G. W. Lindsay	1
J. S. Branson	1
Total	9
Total number of cattle at fair	545
Amount of stall rent sent W. R. Mellor, secretary	$543.00

I would suggest that to make it plain that only breeding cattle are entitled to be shown in classes except steers, that the premium list should so show in large type. Steers were shown in breeding classes at the fair, although they were not awarded premiums in the classes shown.

Also that the rule on page 23 at lines 19 to 22 be made over three years and six months, or forty-two months old, and must have produced a living, fully developed calf in the preceding eighteen months. This corresponds more nearly to the rules of other fairs and is more equitable.

No assignment of stalls should be made unless fees for same are paid.

I would suggest that there be full classes and premiums for Nebraska cattle only in all breeds.

That money premiums be paid in sweepstakes and a grand champion bull and cow class with money be added to the premiums now paid. I regard this last as very important to the success of the cattle division. In addition the ribbons so designating these sweepstakes and champion awards should be ornamented with appropriate buttons with characteristic heads of the different breeds.

I hope the board will arrange to have a catalogue for the next fair with all live stock entries numbered and require all attendants to wear large placards, with the numbers in large type, with the age and weight on it for the assistance of the judge.

That a calf class be added to the fat steer classes and that three moneys be paid in each class. A small amount of work on the part of the superintendent would bring large entries in this class and would be a drawing card.

There was some complaint that aged cattle in Polls and Angus and Galloways were only allowed three moneys and the calf classes six moneys. This sometimes works a hardship, but I would not recommend any change in the list as it now is.

I desire to congratulate the Board on their selection of judges. Their work was faithfully and conscientiously done.

I also wish to express my heartiest thanks to the Board for their great courtesy to me and their untiring efforts to make the cattle show the great success that it was.

Cannot two of the old barns be moved north of the new barn for the nurse cows? We could collect $1 for each cow and the owners would appreciate the accommodation.

I desire to call the attention of the Board to the fact that the Nebraska fair bids fair to make a greater increase next year than it did this in entries in the cattle department, and I would consider it wise for the Board to make arrangements for room accordingly.

Yours truly, O. E. MICKEY.

REPORT OF SUPERINTENDENT OF CLASS C.

PAWNEE CITY, NEB., October 22, 1907.

To the Honorable President and Board of Managers of the Nebraska State Fair:

I beg leave to submit the following report:

The swine show at the fair of 1907 was 25 per cent larger than in any previous year, there being 1851 hogs on exhibition classed as follows: 936 Duroc-Jerseys, 656 Poland-Chinas, 156 Chester Whites, 103 Berkshires.

The show of Poland-Chinas, Chester Whites and Berkshires was superior in quality to any exhibitions of the breeds ever seen in the Nebraska state fair grounds. The Duroc-Jerseys exceeded any previous show in numbers and equally as good in quality.

Our judges used great care and good judgment in placing the awards and gave the best satisfaction to the exhibitors of any judges in recent years.

Some dissatisfaction was manifested by some exhibitors in regard to the location of our hog barns. All agreed that our plan of barns is more suitable for housing the stock than one large barn and if they could be provided with a roof built across the street from east to west large enough to show under, that we would have as good accommodations for a swine show as any of the great state fairs.

The amount collected for pen rents was $699, same turned over to Secretary Mellor.

All of which is respectfully submitted.

L. W. LEONARD, Supt. Swine.

REPORT OF SUPERINTENDENT OF CLASS D.

PALMER, NEB., October 25, 1907.

To the Nebraska State Board of Agriculture:

Your superintendent of Class D (sheep) would respectfully report that the exhibit in this class was more than double this year to what it has been in former years, and it was caused by the increase in the premiums offered and the classification, which was heartily approved of by all exhibitors.

The exhibitors made the following recommendations:

1. That the sheep barn be used for sheep exclusively.
2. That there be more classes added to the list.
3. That a portion of the pens be floored overhead for a place to put their feed.
4. That you continue in the same manner of judging you did this year.

And your superintendent further recommends that more classes be added to the list and in so doing you will have the barn filled to overflowing with sheep. Respectfully yours, R. M. WOLCOTT.

REPORT OF SUPERINTENDENT OF CLASS F.

To the President and Board of Managers of the State Board of Agriculture:

This being my first year as superintendent of Agricultural Hall I have taken pains to observe closely the wishes of the Nebraska State Board of Agriculture and the Board of Managers in my department, and I find that the members of the Board spared no pains and lost no opportunity to do everything that would add to the pleasure and the satisfaction of the exhibitors.

While the number of county exhibits was somewhat less than in some previous years, yet it was the general opinion of both exhibitors and visitors, that notwithstanding an unseasonable year the exhibits were of a higher grade, were more artistically shown, and attracted more attention and aroused more interest than ever before. It is my opinion that the men in charge of the various county exhibits were more expert in collecting and installing their respective exhibits and obtained better effects from the material they had to display than in any previous year of the fair. The fact that a large majority of the same exhibitors will be in charge of county exhibits next year assures an unusually high character to the display to be made in Agricultural Hall in 1908.

The newly adopted plan of dividing the state into three districts for the judging of the county exhibits, is in my opinion the very best system that has been adopted by the Board and I heartily recommend it be continued. The only suggestion I would make, based on the exhibits of 1907. would be possibly the throwing of Red Willow and Frontier counties into the western district instead of the central; my belief being that their resources and exhibits more nearly approach in character those of the other counties in the western district.

The system of scoring the county collective exhibits, known as the Ream score card, which was adopted definitely during the past year by the board, worked to the general satisfaction of practically all of the exhibitors. The only objection that came to my attention under this system was in some cases where the exhibitors showed less varieties, but larger amounts of products. For instance, a county with a limited amount of material, but answering all the requirements of the score card in numbers of varieties can, under the present system, score higher than a county showing larger quantity of products, but less varieties.

I do not mean to recommend that a county should score highest on quantity alone, but that some method should be found by which an exhibitor who has spent much time and money to produce a large and attractive exhibit, should receive some suitable credit on the score card for his efforts.

As I was also superintendent of Class F, I take the liberty of also herewith submitting a few recommendations and suggestions pertaining to changes in the published premium list for this class, as follows:

Lot 1

Premium No. 912—Substitute "White hulless barley" in place of "Pearl barley."

Premium No. 917—Instead of "Jerusalem" read "Jerusalem and Milo maize."

Premium No. 919—Instead of "Red Kaffir corn" read "Red or white Kaffir corn."

Premium No. 922—"Broom seed" leave out.

Lot 2

Premiums No. 923, 924, 925, 927, 928, 929, 931, 932—Leave out fourth prize.

Premium No. 934—Instead of "Common or golden millet" read "Siberian millet."

Lot 3

Premium No. 937—"Best large yellow dent." Add words, "nine inches and over."

Premium No. 938—"Small yellow dent," read "seven and a half inches and under."

Premium No. 942—"White popcorn," should read "White rice popcorn."

Lot 4

Premium 948—"Large yellow dent" add " nine inches and over."

Premium 949—"Small yellow dent" add "seven and one-half inches and under."

Premium 953—"White popcorn," read "White rice popcorn."

Lot 5

Add premium 971a—Red oats.

Premium 974—"White pearl barley" read "White hulless barley."

Premium 990—"Common or golden millet" read "Siberian millet."

Add premium 996a, sheaf of broom corn.

Lot 7—Vegetables.

Leave out premium 1013 and substitute for this premium "White onion sets, ¼ bu." Also add premium 1013a, "Red onion sets, ¼ bu.," and 1013b, "Yellow onion sets."

Add premium 1034a, "Best display of peppers."

Lot 8—Vine Products.

Premium No. 1045—Cucumbers, read "Yellow seed cucumbers" and add 1045a, "Green slicing cucumbers."

Premium 1046 should be placed in Lot 8 instead of Lot 9.

In conclusion, I desire to express the general satisfaction of the exhibitors in this department and of myself with the uniformily excellent treatment accorded to us at all times by the members of the State Board and of the Board of Managers. Respectfully submitted,

WM. JAMES, Supt. of Agriculture.

REPORT OF COMMITTEE ON SCORE CARD.

September 28, 1907.

Mr. W. R. Mellor, Secretary State Board of Agriculture.

DEAR SIR: In accord with our instructions from Mr. J. D. Ream, the committee respectfully submit the following report:

This report contains suggestions for certain changes in the score card, also recommendations for a few additional requirements which exhibitors should follow.

SUGGESTIONS CONCERNING SCORE CARD.

The committee suggests that a classification of articles to be exhibited be made, as shown on face of sample score card. That the scope of each class as described below shall be printed on back of each score card.

That 100 points be given to dent corn and that a separate class be made, given fifty points, called "Other Corn," including varieties of flint corn, pop-corn, sweet corn, etc.

That rye and barley together be given 100 points.

That the class, "Other Varieties of Grain," which is given 100 points, shall contain speltz, emmer, buckwheat, field peas, field beans and Kafir corn.

That a class called "Seeds of Forage Crops" shall be given 100 points and shall contain the threshed seeds of grasses, clovers, alfalfa, millets and sorghums.

That the class, "Grain in Sheaf," shall contain all grains except corn and that the bundles shall be of specified size.

That the class, "Native Grasses," shall be exhibited in bundles of specified size. That each variety must contain bloom or seed.

That the class, "Tame Grasses," shall include all cultivated grasses and legumes in forage form, except corn, and bundles must be of specified size and contain bloom or seed.

That the class, "Potatoes," shall include both late and early varieties, and sweet potatoes.

That the class, "Onions," shall be changed to include onions, cabbage and tomatoes.

That the class, "Cabbage and Beets," be changed to root crops, and shall contain table beets, sugar beets, mangels, rutabaga, turnips, carrots, parsnips and salsify.

That the class called "Miscellaneous" shall be divided into miscellaneous field crops, and garden crops, and that each division be credited with twenty-five points. Miscellaneous crops shall contain both threshed seeds and sheaf exhibits of hemp, flax, sunflower, tobacco, and all other field crops not included in the classes above mentioned. That miscellaneous garden crops shall contain cauliflower, egg plant, peanuts, radish, cucumbers, gourds, and all other garden crops not included in classes above mentioned.

That the class, "Artistic Display," shall be changed to artistic display and taste.

That 100, 60 and 40 be the relative values placed upon good, medium and poor varieties, respectively, instead of 100, 80 and 60, as was formerly used. The purpose of this change is to make greater difference between meritorious and inferior exhibits. It appears to be the only way to place greater value upon high quality by this system of scoring.

That fractions (decimals) be used on rating (basis) sheet, in order that judges' marks may bear the test of criticism on accuracy in marking.

RECOMMENDATIONS CONCERNING GENERAL EXHIBITS.

That each exhibit shall be correctly labeled with a tag on which is written the class and variety name.

That each exhibit not conforming to the standard requirements (of Class F) of size, numbers, or quantity shall be rejected.

The committee believes that the adoption of above recommendations will accomplish the following:

1. Give a more justified rating to exhibits based upon the value of the crop to the state.

2. That under the present classification as outlined on the score card, the values are too high on some crops; example, barley and rye receive 100 points each, which is the same rating placed upon corn and wheat.

3. That under the present system the seeds of grasses, clover and alfalfa are not given a rating comparable to their importance to the state, when thrown in the class with miscellaneous.

4. Under the present system tomatoes are thrown in miscellaneous, and they should have an equal rating with onions and cabbage.

5. Under the present system turnips and carrots are thrown in the class of miscellaneous, and should be rated equal to beets.

6. That under the proposed changed system the quality and general appearance of exhibits will be of a higher standard when required to conform to rules of Class F.

7. That space will not permit the exhibitor to fill his shelves with inferior varieties.

8. That the new classification with the suggested quality rating will encourage counties to collect exhibits of crops most valuable to our state.

9. The requiring of each exhibit to be correctly labeled tends to discourage duplicates under different names.

10. The system of tagging each exhibit will add greatly to the general appearance and educational value of the exhibition as a whole.

MARTIN NELSON,
VAL KEYSER,
W. E. EWING,
Committee.

SCOPE OF PROPOSED CLASSES FOR BACK OF SCORE CARD.

Class of Product.	No. of Points.	
1. Dent Corn..........	100	Contains all of the standard field varieties.
2. Other Corn.........	50	Includes varieties of flint, pop-corn, sweet corn, squaw-corn, etc.
3. Wheat.............	100	Includes all varieties of wheat.
4. Oats..............	100	Includes all varieties of oats.
5. Barley and Rye...	100	Includes all varieties of barley and rye.
6. Other Varieties of Grain.	100	Includes speltz, emmer, buckwheat, field peas, field beans and Kaffir corn.
7. Seeds of Forage Crops.	100	Includes threshed seeds of grasses, clovers, alfalfa, millets and sorghum.
8. Grain in Sheaf....	100	Includes all grains except corn, exhibited in sheaf form, and bundles must be of specified size.
9. Native Grasses....	100	Includes all varieties of grasses, not cultivated, must be exhibited in bundles of specified size, each exhibit showing seed heads or bloom.
10. Tame Grasses.....	100	Includes all cultivated grasses and legumes in forage form, except corn. Bundles must be of specified size and contain bloom or seed.
11. Potatoes..........	100	Includes both Irish potatoes and sweet potatoes.
12. Onions, Tomatoes and Cabbage.	100	Includes all varieties of onions, and onion sets, standard tomatoes, and preserving tomatoes, and all varieties of cabbage.
13. Squashes, Melons and Pumpkins.	100	Includes all varieties of field and garden squashes, field and sweet pumpkins, all varieties of musk melons, watermelons and citron.
14. Root Crops........	100	Includes table beets, sugar beets, mangels, rutabaga, turnips, carrots, parsnips and salsify.
15. Miscellaneous— Field Crops.....	25	Includes both threshed seed and sheaf exhibits of hemp, flax, sunflower, tobacco and all other field crops not included in classes above mentioned.
Garden Crops ...	25	Includes cauliflower, egg-plant, peanuts, radish, cucumber, gourds, and all other garden crops not included in classes above mentioned.
16. Artistic Display and Taste.	100	
17. Number of Varieties.	100	

SCORE CARD (Sample) ....COUNTY, 190....

CLASS OF PRODUCT	Number of Points	Number of Varieties	Good	Medium	Poor	Taste	Good Features	Bad Features	Score	Judges' Average Score
1. Corn—Dent	100									
2. Other Corn	50									
3. Wheat	100									
4. Oats	100									
5. Barley and Rye	100									
6. Other Varieties of Grain	100									
7. Seeds of Forage Crops	100									
8. Grain in Sheaf	100									
9. Native Grasses	100									
10. Tame Grasses	100									
11. Potatoes	100									
12 Onions, Tomatoes and Cabbage	100									
13. Squashes, Melons, and Pumpkins	100									
14. Root Crops	100									
15. Miscellaneous—										
Field Crops	25									
Garden Crops	25									
16. Artistic Display and Taste	100									
17. Number of Varieties	100									
Total Score	1600									

REPORT OF SUPERINTENDENT OF CLASS H.

To the State Board of Agriculture of the State of Nebraska:

GENTLEMEN: I have the honor of making the following report on the exhibit made under Class H at the last state fair held in Lincoln, August 30 to September 6, 1907.

The exhibit was larger and uniformly better than that of any previous year in oils, water colors, drawing and photographs, but not so good in china painting, pyrography, and baskets. In these three lots the work was more amateurish than usual. I cannot account for it. The same care was given to those departments that has been given in former years. The juvenile department was larger and better in quality than any previous year. The spirit of the arts and crafts has come to the youths of our public schools and appeals to them. Manual training departments are fast being established in our schools, and drawing, modeling, basket-making and sewing are also a part of every day's work and training. It is conceded by all up-to-date educators that these things should have a place in every child's education to train his mind to comprehend and appreciate and his hands to produce them. Training along these lines means so much to the home and makes it more attractive. Culture of the hand and heart are needed to develop a well rounded character. To my mind it is very important that this encouragement should be given at this time to the youth of our state, when manual training is taking its place alongside of mental training as it is in our public schools. In wood carving, pyrography, baskets and bead work they have to compete with men and women. This is not just. Therefore, I recommend that these lots be added to the juvenile department.

The new lot, Lot 11, Collective Exhibit of Public Schools, was excellent, and attracted much attention. The foremost educators of our state studied the exhibit carefully and commended us for creating the department. It also attracted the attention of the thoughtful public, and proved to it that the average child is as capable of drawing, combining colors and producing beautiful forms as he is of reading, writing, or spelling. Lincoln and Beatrice sent exhibits. It is hoped that other schools will join them next year.

Art Hall, as you know, is very crowded. I would recommend that as soon as your Board can, it provide a building to house the exhibits of classes H and J. They are both very much in need of a proper place. I plead for Class J. It is very much in need of a better place.

The accompanying premium list I recommend for next year. Hoping that you will see your way clear to allow it, with accompanying changes.

Wishing your board success in all of your endeavors for next year, I am, sincerely yours, MRS. F. M. HALL, Supt. Class H.

REPORT OF SUPERINTENDENT OF CLASS I—DAIRY.

VERDON, NEB., November 1, 1907.

Mr. Mellor—Dear Sir: The superintendent of Class I, dairy, for the fair of 1907, would make the following report:

Number of applications for space to exhibit cream separators, nine. I found that according to arrangements I could only assign space to seven of them in the dairy building. One of the other two was located in the poultry building and the other in the machinery department. For the use of space I received $38.60. This money was turned over to the superintendent of concessions and I hold his receipt for the same.

Much credit is due The Beatrice Creamery Company for their splendid exhibit. There were only three exhibits of cheese and two of butter. Mr. E. M. Little had charge of lots 11 (milch cows), 12 and 13, Class B. I suppose he has reported on the same. I have no recommendations to make at present. Respectfully submitted, V. ARNOLD.

REPORT OF SUPERINTENDENT OF CLASS I—LOTS 8-12.

LINCOLN, NEB., November 10, 1907.

Mr. W. R. Mellor and State Board of Agriculture:

GENTLEMEN: Your favor of October 16 received, and I gladly send you the report of my work, as superintendent of lots 8 to 12.

The culinary department was not as well represented this year as in previous years, but was exceedingly nice. The exhibits in the fruit department were not as large as last year, but were excellent in quality. I think one cause for this was the high price and scarcity of fruit. Another reason given by many of the ladies who have been exhibitors in past years is that the premiums are so small that it does not pay them to exhibit.

I have been an exhibitor in this department for years in the past and know from experience what the cost and work of getting up an exhibit is. I also have a few recommendations which in my judgment will make this department much better another year.

I will suggest that you give higher premiums in this department. First premium one dollar, second premium seventy-five cents, and third premium fifty cents. Also that all canned fruit and vegetables be put in quart jars, nothing larger or smaller be allowed, and that all preserves, butters and jams be put in pint jars and nothing smaller be used, and all jellies be put in regular jelly glasses with tin lids. If all conform to these rules the exhibit will be more attractive and easier to handle; and if possible have the culinary and fruit department both together in the same building. Let the exhibits be like the educational were this year. Near enough so the state fair visitors can see and examine them better. Many complained because the exhibits were so far away that they could not see and examine them.

I would suggest that you add the following articles to your premium list:

Lot 8, Boston brown bread, mahogany cake.

Lot 9, canned corn, canned beans, canned peas, canned pineapples, canned pumpkin.

Lot 10, preserved watermelon, preserved quince, strawberry jam.

I wish to say that the superintendents of the bee and dairy building showed me every courtesy and did all in their power to make the department a success.

With many thanks to yourself and gentlemen of the board for all past favors I will close by congratulating you on the success of the state fair this year, and sincerely hope it will be still better next year.

Yours respectfully, MRS. I. FRISHETTE.

REPORT OF SUPERINTENDENT OF CLASS J.

The Nebraska State Board of Agriculture, Lincoln, Nebraska.

GENTLEMEN: Allow me to submit herewith report of the work of the Nebraska Boys' and Girls' Associations. These associations are now in their third year of existence. Their work began in the spring of 1905 under the direction of the State Department of Public Instruction. Through the cooperative assistance of the University of Nebraska, the State Board of Agriculture, the School of Agriculture and the State Organization of Farmers' Institutes, the organizations have grown from the first enlistment of 500 boys to a total membership to date of over 8,000 Nebraska boys and girls representing every section of the state. Agricultural education and industrial training have taken new life in hundreds of schools and homes which have been reached through the activity of these young people. In cooperation with county farmers' institutes and county fairs, our county organizations have contributed an element of life interest and activity and have represented an educational principle which has already shown its value in the changed attitude of the people in recognition of the value of scientific principles and practice in agricultural pursuits and in the making of a home.

Agricultural and domestic science clubs have been organized throughout the state. These organizations vary from county associations, to city, town, village and rural school clubs, which have for their object the enlistment of young people, and through these young people the parents and the homes of the community, into a better appreciation of the value of opportunities offered for the betterment of the home life when dignified by the application of study, thought and industry in the proper cultivation of the soil, care of domestic animals, utilization of products, the practice of domestic art and the development of individual efficiency applied in the every-day life of the home.

The spiritualization of country life is dependent upon the attitude of the people, the interest they take in the improvement of existing conditions and in their activity in seeking the best there is or the best that may be secured for the community, for the home and for the individual.

The activity of our young people in its simple, earnest way has done more toward creating a proper degree of respect for industrial efficiency, and has helped more to dignify the calling of the farmer and the home maker than have text-books, lectures, schools and other more dignified means which yet feel the need of a more effective means of reaching the home.

These organizations have proven a most effective means of bringing schools of agriculture, home economics and manual training into the home where every member becomes a pupil who learns to know and to do by doing. Our agricultural and home economic schools are too few, too distant, too little known, too stationary, to bring more than a very small percentage of our young people through their doors. We must, in a measure, bring these schools into the home if we would reach the great mass of the people. Our young people are the entering wedge. Our organizations provide the motive force. With continued encouragement and assistance we hope to more firmly establish the principle that measures which lead the boy and the girl to a keener interest in the home, to a better appreciation of home life, and to the cultivation of a greater degree of individual efficiency as a factor in the home and in the community life—these are educative in the highest sense and represent a necessary part in the proper development of the civic, moral and industrial life of the state.

The rapid growth in membership and the greater territory of operation opened has made necessary a change in the management of our work. From the direct state management of the first year we have evoluted to the indirect and more effective plan of making the county the unit of management. Under this plan the detail work of the state organization is reduced and a greater number of homes are reached. The county superintendent of schools is made the county manager and all the work is directed through his office. The county meetings and contests bring a much larger proportionate attendance of young people and of their parents than does the state meeting. At one of our county meetings last year, more than 1,000 boys and girls were in attendance at the afternoon meeting.

Our plan now provides for a county contest and convention with an appropriate program, at which the young people of the county exhibit some results of their work. The exhibits receiving highest scoring are sent to the state contest. The state contest and state meeting for delegates from the various counties has an important place. It affords a needed incentive, a unifying and controlling influence that is necessary to continued successful work through schools which are under a changing leadership as represented by the teachers and the county superintendent.

To this time, our organizations have not had the support of any direct appropriation by the state. Like many other good works, it has had to first establish itself through the efforts and assistance of those whose faith in its ultimate good has induced them to lend a helping hand.

Fully appreciating the encouragement and assistance given us and trusting that we have made proper and effective use of all that has been granted us, both directly and indirectly, we are hopeful of the approval of our efforts and most respectfully request the continued cooperation of those agencies which are interested in the development of the agricultural and the home interests of th state.

This year the Nebraska Corn Improvers' Association is assisting by bearing the labor and expense incident to the state contest and convention. The University of Nebraska through the state organization of farmers' institutes has cooperated during the year in the issuing of three bulletins of 8,000 copies each, in arranging dates with county farmers' institutes and in providing for each of our county contests and meetings, a corn judge and a woman speaker who assist in arranging and judging exhibits, address the meetings of boys and girls, and of men and women, conduct judging contests and assist in whatever capacity seems best at the various points. The Department of Home Economics of the University of Nebraska has assisted by providing bulletins on Home Economics and by furnishing speakers who have assisted in organization of county clubs and district clubs and in conducting contests and conventions. The State Board of Agriculture last year aided directly by an appropriation of $200 to provide premiums for the state contest, and indirectly by conducting the acre contest in which $150 was paid in prizes, and by offering premiums at the state fair for exhibits of school and home gardening and for cooking, sewing and manual training exhibits.

Our state premium list will this year be arranged on the same plan as that of last year, with this exception: The plan of dividing the state into three sections for classifying county collective agricultural exhibits at the state fair will be used this year in the principal classes in the corn contest. We have also added the acre contest, which proved to be a valuable feature as conducted last year by your board.

Believing that both the direct and the indirect good which has come to various county fairs and to the state fair through the increased interest and effort of our organization is a factor of recognized value, and that in the broader general view, you maintain toward the agricultural development of the state, you recognize the importance of our work to the state, we respectfully make application for your continued cooperation this year by appropriating from your general funds for our state prize lists, a sum of money equal to that expended last year in the encouragement of our work, viz., $350.

Very truly yours, E. C. BISHOP, Deputy.

REQUEST FOR MORE ROOM FOR CLASS K.

STATE FAIR GROUNDS, September 5, 1907

To the Board of Managers, State Board of Agriculture.

GENTLEMEN: We, the undersigned exhibitors in Class K, respectfully represent to your Board that the growing interest in the exhibits of this class requires the exclusive use of the building devoted to bees and honey, and request that at the coming fair the entire building be given to apiarian exhibits, together with such incidental rearrangement of shelving, etc., as may be necessary to properly install exhibits. The exhibits at the present fair have been materially curtailed owing to lack of room, and with the possible entrance of other exhibitors the coming year, we feel that this action on the part of the Board will be essential to do justice to all exhibitors. Respectfully submitted,

ROSE LAWN APIARIES.
G. D. CALEY.
TRESTER SUPPLY CO.
MRS. ELIZABETH M. ODELL.
MRS. E. WHITCOMB.
H. A. WHITCOMB.

I concur in the above recommendation.

W. C. CALEY, Superintendent Class K.

REPORT OF SUPERINTENDENT OF CLASS M.

MINDEN, NEBR., October 26, 1907.

To the Board of Managers, Nebraska State Board of Agriculture:

GENTLEMEN: I herewith submit my report as superintendent of Class M, for the year 1907, showing the names of each exhibitor, the amount of transportation furnished each, and the kind.

I also submit the following recommendations for your careful consideration:

1st I would recommend that the American Steel & Wire Company be changed from the lots that they now occupy, for several reasons that I consider well taken. This ground is needed for the machinery men, who are asking for it, and in order to make our showing in this line more uniform ought to be used for that purpose.

I believe that all the fence exhibitors should be brought together, and the present lots occupied by the old cattle barns would be a good place and could not but please the fence men. I have had many complaints from other fence exhibitors that we were showing favors to the American people, and while I have assured them that such was not the case, this feeling exists to such an extent that our fence exhibits are falling off and this should not be, as all other exhibits are increasing each year. This in my opinion would be helped very materially if we would compel all of these people to come together.

2d. I would recommend that an office be built, or bought, on the corner where the building now owned by the American Steel & Wire Company's building now stands (the building that they have would make a splendid office for the superintendent), as this is the first corner the exhibitors reach on arriving at the grounds, and the superintendent is the first man that they want to see. So, by having this building where it would be easily found, it would make it much more convenient for the exhibitors, say nothing about the help it would lend to your superintendent. Then, besides, it would be a place of general information as to that department. I was more than surprised at the results and the satisfaction to all exhibitors and visitors by having the tent we used this year, although it was not known by very many that we had an office near the grounds. The headquarters for the superintendent should be shown up by proper signs, in such places as the general public could readily see them, so that on entering the grounds they could see where to go for the information they would desire in that department. I had a great many inquiries this year after the general exhibitors in the different lines by patrons of our fair that were interested in one line or another, and in my opinion this is a very essential thing for us to be ready to give this information to our patrons. This should be made a permanent matter and would make it very much more easy and satisfactory to all concerned, I am sure.

3d. I would recommend that lots 119 to 134 inclusive be used hereafter for thresher row, for the reason that they are 115 feet deep and it takes about that much room for a thresher outfit. The lots now used are only 80 feet, and in order to accommodate them we have to set out in Macfarland avenue, so that there can be regular lines observed, and makes our front appearance rather bad. Then again, by moving these engines and threshers we would get the whistling and smoke nuisance farther away from our race tracks. Of course we could accommodate our threshers by doing away with Rudge avenue, or in other words, we could let them occupy that street instead of letting them out into Macfarland avenue, but this I would not recommend only as a last resort. I have thought this matter over very carefully and that we should make this change now before we get any more permanent improvements put up that we might have to move in order to get them where we want them, should this space be needed for the threshers.

4th. I would recommend that all lots lying north of Macfarland avenue be used hereafter for hay presses and feed mills in operation, and that the lots be made forty feet wide in the place of twenty-five feet, as they now are. Twenty-five feet is not wide enough for a sweep hay press, and fifty feet is too wide, and for a superintendent to try to divide these lots is not an easy matter at all times.

There seems to be a general feeling among the exhibitors, and this feeling is growing, that they ought to build a permanent building for their exhibits, and I presume that your Board will have several applications for this kind of space before our fair in 1908, as several of the exhibitors told me that we would see them with their own buildings next year.

The machinery exhibit was greater than last year. We had 118 exhibitors last year, while this year we had 126, and in my judgment our show was at least 25 per cent better than last year, both in assortment and arrangements. Every exhibitor assured me that they were more than pleased at the results of their efforts, and especially with the treatment at our hands, and assured me that they would be with us in 1908, and many made application for space. To me this is more than gratifying and I am sure that it will be to your honorable body. The exhibitors in this department are congenial and accommodating business men whom it is a pleasure to meet, and to try to satisfy their many wants has been my special aim. How far I have succeeded in this matter I leave to you to decide. Respectfully submitted,

I. W. HAWS, Superintendent Class M.

REPORT OF SUPERINTENDENT OF FORAGE.

LINCOLN, NEB., September 6, 1907.

Contract let by Board of Managers to Chas Kittenger, he to supply and deliver to the exhibitors, at contract price, hay, straw, etc., and receive money for the same, which relieves board from any cash responsibility. Contract performed satisfactorily to superintendent.

Respectfully submitted,

CHAS. MANN, Superintendent.

MISCELLANEOUS.

ADDRESS BEFORE DUROC–JERSEY ASSOCIATION.

BY GEORGE COUPLAND.

Mr. Chancellor: It is with more than ordinary pleasure that I rise to respond to your cordial address of welcome. This society has asked me to act in their behalf and I am well sure that what I shall say will voice not only my own feelings, but the sentiment of this entire association.

To have you, as the representative head of the State University of Nebraska, welcome us, we assure you is something that we highly appreciate, and this feeling of appreciation is deepened, because we are aware of your intense personal interest in our association and its members, as well as all the allied interests of agriculture that have and will be represented here during this week. To have the trained personality who stands at the head of the highest school of learning in this state manifesting so deep a personal interest in an all around agriculture is something of which we wish to show our appreciation, for while this is an association of swine breeders, yet we take pleasure in looking over the fence into our neighbors' field and also take enjoyment in walking around with them and gathering inspiriation from personal intercourse as well as from observation of methods and things accomplished.

We realize, too, that while our business is an important part of the agricultural machine, yet it is only a part, and for that reason we are desirous of responding to the all around influences—if I may be permitted to so designate them—that are provided for us during this week's meetings. Of course we shall talk business, yet I make bold to say that that will be largely subordinated to the pleasures that we shall get from personal intercourse and those things that satisfy the cravings of our own individuality.

Mr. Chancellor, in an address that you made the other night, and which I had the pleasure of listening to, you used the trite saying, the "top part of man." Most expressive it was and is, for there is a top part of us that craves for food; all men have it more or less I believe, at least at some period of their lives, and what good we carry home from these meetings will have been absorbed by that part of us, for it is in the upper story of out anatomy where the mechanism exists that drives the machinery necessary to our success in our daily employment.

That educated and cultured men have come to take so deep an interest in things agricultural has meant much and does mean much for their rebuilding and development, for unquestionably it is the moral and intellectual education of the men and women who live on the farms of the country that will lead to the recognition of the fact that these are the first and main steps necessary to real success.

I am very sure that the experience of those who have been in the habit of attending these meetings has been that that which influenced them the most strongly was the personal influence of the people they heard and met, the inspiration gathered from their different personalities and the ideas coming from them, especially that which appealed to the top part of themselves. The enthusiasm that is begotten by association with our fellows supplies largely the motive power for the operation that we carry on. The trend of the times is upward and onward, and nowhere is this more evidenced than in agricultural pursuits; and I think, without question, it is largely due to the interest manifested by intelligent and thinking people in its development. The economic side of it doubtless has had its influences, yet, I believe, far above it all for permanent influence have been those things which have appealed to and worked through the higher part of us.

What we have received in the years gone by at these allied gatherings and the hearty reception and welcome that you have given us today makes our appetites doubly keen for the feast of good things and flow of soul that we shall be permitted to enjoy this week. That we, ourselves, be in tune to all the harmony around us is something we desire, for we have left our homes with a purpose, and that purpose is not merely to get for ourselves, but to give of ourselves, for we know that by so doing we shall go home loaded down with good things. Some time ago, in talking with my aged father, we were speaking of bygone days and old-time associations. He was in a very reminiscent mood, and, like all old people, he takes great delight in rehearsing the days of long ago. Speaking of one of his boyhood companions and of the delightful times that they used to have in the fields and lanes of the haunts of his boyhood, he spoke of how they used to love the birds and flowers and of one of the things that his boyhood friend took great pleasure in doing. The boy's father was a great lover of roses and had a most beautiful assortment in his gardens. The lad used to take the buds from these trees, put them in his pocket, and, as they walked up and down the lanes, would take out his budding knife and insert a bud here and there in the wild briars that grew in the hedgerow. These growing and blooming in after years afforded great pleasure and amusement for those who, like themselves, were fond of the rural haunts and country joys. As I listened to the old man, I thought what a lesson to us all; if we would only fill the pockets of our own personality with good things and, as we journey around, no matter how rugged, sharp, or thorny our fellows are, if, with skilful hand and thoughtful mind, we seek to insert that which is useful and beneficial, what fragrance of spirit and what a wonderful change we should see in our associates and their surroundings!

Evolution has worked wonderful changes through the passings years, and you, at this institution, have accomplished great things in the development of plant and animal life. But the most striking thing that we have seen evolved during the past decade has been the blossoming out of a scientific agriculturist from the common every day hayseed.

It may be that the different elements in our nature are a little discordant at times, and to have opportunities such as these afford us without doubt add to our ability, and, when we return to our farms, we shall drink deeper and oftener of the real pleasures of our surroundings and thus become better equipped and strengthened for our work; and, if our ability to absorb and imbibe, even in a small measure, the beautiful spirit of Mrs. Browning, who gave us these inspiring and suggestive lines, we shall come back rejuvenated in spirit as our annual gatherings come and go:

> "The little cares that fretted me,
>   I lost them yesterday
> Among the fields, above the sea,
>   Among the winds at play,
> Among the lowing of the herds,
>   The rustling of the trees,
> Among the singing of the birds,
>   The humming of the bees,
> The foolish fears of what might happen—
>   I cast them all away
> Among the clover-scented grass,
>   Among the new mown hay,
> Among the husking of the corn,
>   Where drowsy popies nod,
> Where ill thoughts die and where good are born,
>   Out in the fields with God."

Mr. Chancellor, we have left our country homes in response to the cordial invitation to feast with you here at this institution, which is yours and ours. Judging from our past experiences, we know that we shall return from these meetings with a feeling of satisfaction and an inspiration for a better and more aggressive work.

We also wish to assure you that we have not come empty handed to visit you, for we bring from many farm homes of this state a hearty word of congratulation for what you have accomplished and which we are sure is merely a small part of what you would like to see done in the interests of the farming communities of our state. We also desire to say that most heartily do we join hands with you in the splendid work that lies before us and which means so much for the betterment of Nebraska.

The influence of that which has been done at this institution reaches out over an ever-increasing area, and the thinking men and women who live on the farms scattered up and down our fair state realize full well that, if we are to come to our complete inheritance, it will have to be accomplished through the education of the boys and girls who are to return to these country homes. I am well assured that every member of this association echoes this sentiment.

We wish you success in your work and we pledge you our best effort to assist in so laudable an enterprise.

Perhaps at this time you will allow me to say something that savors more or less of the personal, yet I feel that it is something that I ought to say. The people of Nebraska have done me the honor of selecting me to sit as one of the members of the governing board of this institution. The position is one of honor and great responsibility. That I have been so selected, I realize is largely because I am engaged in agricultural pursuits and that the ever-increasing demand for advanced education upon specific lines, which will give a more intelligent as well as skillful rural population, is recognized to be a call which we must give heed to.

Observing and thinking men realize its supreme importance, not merely from an economic standpoint, but that the demand of the age is for a moral and intellectual development necessary to a well rounded out personality.

Men of all shades of thought and different occupations have and are agreeing that this is a most important matter, especially when we remember how dependent our state is, and even the nation, upon its landed possessions, as well as its rural population.

Personally I am intensely interested in the education of all our people, because I know that the finer the fiber of our intellect, the more appreciative we are of what is necessary to a well made man or woman. I would not limit the reach of mind, even if I could, for it is in that reaching after, that gives the more intense pleasure to the "top part of us." So in taking up my duties of regent, it will be with a sincere desire to supplement, if I can, the splendid work done by my associates and their precedessors. However, coming back to the fact referred to, that my selection was due to my association with agricultural pursuits, I know that the people of Nebraska demand aggressive work along the lines of advanced agricultural education, and that they are looking especially for development in that direction.

If I can add, in ever so small a way, to that which has been already accomplished, and assist in the further unfolding of the plans for the best possible education for our country boys and girls, it will be one of the greatest pleasures of my life.

ADDRESS BEFORE BREEDERS' ASSOCIATION.

BY W. H. TAYLOR.

Brother Breeders and Friends: Another year has gone since last we met. In reviewing the year we find many strange features—some things that we have never before come up against.

Who of us have ever before seen corn selling at 50 cents, dressed pork at $10 to $20, with hogs selling at our railroad stations for $3.40 to $4 per hundred.

I wonder why our packing centers do not appeal to the pork producers for aid to tide them over the pinches that come along like the flurry we have just gone through, or rather are in. This is one of the hardest propositions we have to face, and we are without redress, because we are unorganized. It looks as though there could be a way devised whereby we could protect ourselves. But this has always been a hard problem—to organize the producers of this country. Some industries have gotten some relief from the oppressor. Cotton is one of these. Millions have been dropped by cotton kings and a like result to tobacco oppressors. John D. Rockefeller is beginning to face some of his nefarious work, and sooner or later his accumulated millions will be scattered out over the land. So this gives us hope that the time will come, and that soon, when the price of corn and dressed meats will correspond with the price of hogs and cattle on foot. The producer does not care how high corn and meat go, if the price of the animal on foot is in proportion.

The laborer may step in here and say he would like to have these things kept in line with his work and surroundings. The great trouble in my opinion is, there is too much done that is not real; too much bought and sold that does not exist. Speculating on any commodity, where that merchandise, whatever it may be, is not on the market, is sure to result bad. It is only a dressed-up form of open robbery. The man who owns, and has it to turn over, any amount of corn, mess pork, or anything else can place it on the market and sell for the high dollar and do an honest business, but when he sells that which he does not own it makes us think. If I wander around too much I am liable to get into politics, so I will get back to a little talk to the Duroc-Jersey breeders of Nebraska.

I wonder if any of the unreal work is going on among us as breeders. I hope not; let us keep our hand clean, do that which is fair and honorable between man and man. The golden rule should be taken into any, and all branches of business. We as breeders have grown to be a very large organization. We realize this when we meet on our fair grounds year after year.

When I began showing the red hog the conditions were very different from now. I used to know all of the breeders, north, south, east and west. We would meet on the fair grounds somewhere, get acquainted and plan for a united action for the developing of what was then a very rough, unpleasing hog to the eye. But he had many features that were wanted at that time, and we took him in the rough as it were, and went to work. At the state fairs of Iowa and Nebraska, in 1907, you had the results of these years of labor, not only in the smoothing up and rounding out of the hog, but the number of breeders have grown until we know but very little about them.

Some of the old landmarks are still to be seen, others their memory is still fresh in our minds, but they have fallen by the way. I have several times come before you with a few scattered thoughts of what I thought might be good for our careful consideration. I have sometimes scored a little deep, but have hewn to the line. There are several matters I might touch at this time, but as I am going to step down and out I will leave it for those that follow me.

This is the last time I ever expect to stand before you as your president. On account of my age and health, I am obliged to close out my herd that I have spent years in getting together. While I have made many warm friends, I have tried to avoid making enemies. To the first I know I have succeeded, to the latter I think I can say the same. It is true we have not always agreed; we are not always in position to look at matters in the same way. We live in a very different age and under different conditions from what some of us have lived. The time has been that we lived more for one another than we do today. The motto today is, "In all things get what you can, get it by fair means if possible, but get it." Our tendency is to lose sight of the other fellow and live too much for self.

I wish to leave with you as I leave your ranks this advice, that you help each other by working together; in union there is strength; don't divide up into classes; do not make yourself believe that any one strain of hogs will do to tie to, for you will find it very different. Some of the best hogs have been bred by men that are hardly known among the breeders, and a line of breeding that is unknown.

In closing, I wish to thank you for the many honors you have conferred upon me since our organization. May you who continue find the work and breeders as agreeable as I have.

ALFALFA GROWING.

BY O. HULL, ALMA.

Having been requested by the secretary of the State Board of Agriculture to write an article on alfalfa for the 1908 report, I confess I hardly know what is expected of me. When discussing any farm subject, that is to apply to all parts of the state, with its great variety of soil and climatic conditions, difference in rainfall, etc., it is no easy matter. I presume it is no longer necessary to argue the question with the Nebraska farmer, as to the feeding value of alfalfa, for its merits in this regard are admitted by all. Neither will it be necessary to use any argument with the up-to-date farmer in convincing him of the value of this crop in helping to maintain the fertility of the soil. Both of these questions have been so thoroughly settled in the school of actual experience that no argument of mine will make the proof stronger. The only question then to be settled is, how can we in the easiest and surest way come in possession of this valuable plant.

GOOD SEED.

First in importance, I think, is the procuring of *good home grown* seed. I do not hesitate to say that more farmers have been discouraged and deterred from growing alfalfa from having sown seed grown in Utah, or New Mexico, or some place too far south, and where it was grown under irrigation. This seed looks much finer than the home grown and will grow all right, but the first winter will kill a large per cent of it. Then, if the experiment is being tried in a section where alfalfa is little grown, the man is ready to blame it to his soil, or climatic conditions, or anything but the real cause, which was seed unacclimated.

TIME TO SOW.

The time of seeding will depend on the part of the state you live in. From the center of the state, west, I would advise spring seeding as a general proposition, and in the eastern half fall seeding. If spring seeding is desired, then I should prefer that the land should have been in corn the previous year, and well tended. Then commence in the spring as soon as the ground is in condition to work well, and thoroughly disc the land, lapping the disc one-half. Then as often as it rains and packs the ground, or if the weeds start, either harrow, or disc again. Keep up this cultivation until the first to fifteenth of June. You will by this means have sprouted and destroyed a large part of the weed seed, conserved the moisture, and gotten the land in fine physical condition to receive the seed. Now sow twenty pounds per acre broadcast. Thoroughly harrow, and you will have no more trouble to get a stand of alfalfa, than of wheat or oats.

If fall seeding is desired, then the land should be shown to small grain the year you intend to seed to alfalfa. When cutting the grain you should follow the harvester with the disc, as this will conserve the moisture, and put the land in shape to plow later on. I do not think it best to plow very deep, but *thoroughly turn* and pulverize the soil. This can be done best by using an extra horse and let him walk on the plowing. Walking thus on each furrow, and harrowing immediately as it does after turning over, and while yet moist, puts the ground in good shape for seeding. Now do not be in a hurry to seed unless you have plenty of moisture. Wait until you get a rain and then sow as described for spring seeding. Do not sow much later than August. If the weeds should come in the spring sown alfalfa, it may be necessary to clip them off. Great care should be used in doing this, as, if you clip it too close to the ground, taking all the leaves off while the plant is young, and has no buds formed on the root, it will kill the plant. A light top dressing of well rotted stable manure, about ten or twelve loads per acre, will be found to aid in getting alfalfa started.

TIME FOR CUTTING.

The alfalfa should be cut as soon as the first bloom begins to appear. If it is to be fed to the hogs and cattle exclusively, then you can commence even sooner than this, as you will have less woody fiber, and hence less waste. It it is to be fed to horses, then it should be allowed to get riper. Just a word here about feeding alfalfa to horses. I do not believe there is any better hay can be fed to young horses especially, or any feed that will make a larger or more symmetrical growth. When fed to work horses it should be fed in limited amounts. If the horse is given all he will eat, he will eat too much and here is the main reason why alfalfa is condemned as a feed for horses. I know horses fifteen years old that have been fed alfalfa all their lives, and show no bad effects from it. Of course great care should be taken in curing the hay to have it as free from dust and mold as possible.

SEED CROP.

If a seed crop is to be raised, the second crop should be used. And here let me say a word to my farmer friends in the western part of the state, where grain crops are not quite so sure as in the eastern part: sow more alfalfa with a view of raising seed. The states east of us will have to look to the west largely for their seed, as alfalfa does not seed well where the rainfall is too abundant. For years when other crops are short, the alfalfa seeds the best and it will always find a ready sale at good prices. Last year (1907) corn in my part of the state (Harlan county), was a light crop, owing to a dry spell in the latter part of the season, and yet I know men here who realized as high as $108 per acre from the year's crop of alfalfa, and many who got from $25 to $50 from the seed crop alone. I do not mention this as an advertisement, but simply to show what can be done in a bad year.

I hope these few suggestions may be of some value to those who have not had much experience in growing this, as I think, one of the most valuable crops that can be grown on the farm.

PASTURING SWINE ON ALFALFA.

REPORT TO NEBRASKA SWINE BREEDERS' ASSOCIATION JANUARY 22, 1908.

BY EDWARD P. BROWN.

I desire to present to you some results obtained from pasturing alfalfa with swine. To make these results clearly understood, it seems necessary briefly to state the manner in which the pasture and the animals have been handled. The average number of sows bred during the years for which complete figures are available is sixteen. They are bred to produce two litters per year. It has never happened, however, that all the sows did have two litters, there being, in every year, from one to four that for one reason or another failed to produce the second litter. The average number of hogs actually sold per annum has been ten and one-half to the sow. The average litter at birth has numbered nine, and no sow has been retained that failed to wean six or more healthy pigs. The animals are all pure-bred or high-grade Poland-Chinas. During the summer months they have had access at will to alfalfa pastures at the rate of about one and one-third acres per sow and have received in addition a light grain ration fed twice a day.

The shoats from the preceding fall litters have had access during the summer to the same or similar pastures, together with a moderate grain ration, except during the last six weeks, when they were fed all the corn they would consume. The hogs have been sold at about ten months old, when they have averaged from 210 pounds to 279 pounds. The prices paid for grain, beginning with 1904, have been 35 cents, 40 cents, 33 cents, 40 cents; the price received for pork has been, 1904, $4.25, $5, $6, $5.50. The column headed, "Return per bushel," shows the price received for corn fed by charging the swine for the alfalfa pasturing at the rate of $10 per acre, a very liberal rent in this vicinity. The column headed "Pasture per acre" shows the return per acre in pork after paying for all grain consumed. The column headed, "Pork, cost per pound," means the cost in grain, exclusive of pasturage.

Year.	Grain.	Pork sold.	Pasture, per acre.	Return, per bu.	Pork, cost per lb.
1904	$648.00	$1142.35	$54.92	52c	2½c
1905	750.76	2216.56	48.85	94c	2¼c
1906	950.99	2777.90	60.85	82c	2⅔c
1907	588.54	1976.40	42.32	6[illegible]c	1¾c
	$2938.29	$8113.21	$206.94	306c	
Average	734.57	2028.30	51.72	76½c	

It should further be said, by way of explanation, that these results have been obtained by one who, until seven years ago, had absolutely no experience in swine growing or any other branch of agriculture. Also, in the year 1907, swine disease forced the sale of all save the breeding stock at an early age and at a very light weight, and also caused the actual loss by death of considerable numbers. These results are presented not as being particularly remarkable but as being fairly accurate. The alfalfa pastures have also produced hay worth $10 per acre per year.

THE HORSE INDUSTRY.

BY ANDREW ELLIOTT, GALT, ONTARIO.

There never was a time when the possibilities of profitable horse breeding by the farmers of the west were greater than at the present time.

The supply of desirable horses is not now equal to the demand and owing to the rapid development of the country it must be years before there is a surplus. To a very great extent the New England and Atlantic states do not rear horses, depending on the west for their supply. As an instance of this, last year the state of Maine imported over four million dollars' worth of horses. The breeding of horses on the range is also being seriously reduced on account of the encroachment of settlers on the open range. And it is also a recognized fact that the farm-bred and reared horse commands a higher price than those bred on the range. These and other conditions make it apparent that horse users must look more and more to the farms for their supply.

It has also yet to be proven that on high-priced land horses can be bred and reared in large numbers as a specialty, but combined with other farm lines they can be made exceedingly profitable. Breeding mares of draft type will do the work on a farm and produce foals that will sell at a good profit at any time. It is a safe proposition for the farmer who depends on the year's return from his farm to meet his annual outlay to leave the breeding of fancy light or trotting stock to others and confine himself to the handling of some breed of draft horse that will during development pay his way in work and find a steady market whenever offered for sale. The country is full of trotting stock that, too slow to bring good money on the track and too light to do profitable work on the land, are not wanted even at a low price, whereas a good, well-fitted horse of good weight always finds ready sale at paying figures. The farmer should have a clear idea in his mind as to what he wants. In breeding he too often acts as though he thought by changing stallions he can from the same mare breed a trotter, a carriage or draft colt. There is no greater mistake which can be made, and from such mating we have the nondescript brute we too often see.

First, as to the mare. Too often broken-down, unsound mares and mares of a poor quality are bred from. Far better would it be not to breed at all than to breed from dams of this kind. The mare should be of fair size and good quality—a good individual and sound. Let her be low and thick, possessed of good bone and feet and as much weight as possible. She will perhaps be of no particular breed, the result of injudicious crossing of grade stallions on grade mares. Start with as good mares as possible. It will pay to sell inferior mares and buy good ones that have a few crosses of good blood in their veins.

Temper and action should be considered in the mare. She should be a good mover, not on the trot, but a clean, fast, upheaded walker. Vice is inherited just as well as unsoundness, and much more surely from the dam than from the sire.

She should have quality. Just a word regarding quality, a term so often used, but often imperfectly understood. Quality is that in the form and appearance of an animal which suggests efficiency for the purpose for which it is intended, hence, we say of a steer, he has good quality, *i. e.*, a good handler, silky hair, thick, firm flesh, a mellow skin indicating that he will take on flesh readily and economically. Applied to the horse it does not mean breed characteristics, but to the utmost degree to live, to do, and to wear. For this, we look for a soft, silky coat of hair, a mellow skin and smooth, flat shank bone, a firm, clean tendon and a general firmness, compactness and smoothness of conformation.

There is also an indefinable something in the sprightly and alert movement in the bright eye and hard muscle; all of these and more are covered by the word "quality."

In opposition to this we have the coarse-haired, hard-skinned, rough-pointed, round-boned, gummy-legged horse. This, combined with the dull eye, pendant lip and sluggish movement, gives us a horse that, however well bred, will be a disappointment and a loss.

Have a definite aim in view. Select the breed and stick to it. Nothing is gained and much lost by using successive stallions of different breeds. Use only pure-bred stallions and the best that can be reached. It is of great advantage if the whole neighborhood handle the same breed of horses. Better stallions can be brought in, and the district will soon be known as a place where good horses of that breed can be obtained.

Then as to stallions. Good ones are not plentiful and are costly. Unfortunately there are many costly horses placed by the slick syndicator that are not good—very much the reverse. It can safely be said that the greatest enemy the horse business has had in many places has been the syndicator who, by ways that are dark and tricks that are vain, succeeds in victimizing a whole community and thereby disgusting them with the whole business.

Again I repeat, use the best stallion that can be obtained. Get all the size possible, but never sacrifice quality for size. Perhaps the worst and most disappointing horse to use is one that has only his weight to recommend him. He must have good feet. The old proverb, "No foot, no horse," is absolutely correct. He should have abundance of firm, smooth bone. The pasterns well sloped and strong. The cannon bones short and flat. The joints smooth and big. The forearm long and it and the gaskin densely muscled. The legs placed well under the horse and squarely carried in walk or trot.

The head should be of proportionate size, forehead broad, eyes prominent. Ears somewhat small and not too close together and neither Roman-nosed nor dish-faced. The lower jaw wide at the base, throat clear cut, neck rather long and massive, and well filled out between neck and shoulder. Shoulder moderately sloping and well covered with hard muscles. Top line shoulder well carried back, giving short back. Ribs well sprung, and carried well down giving depth to the middle piece. Loins long and well carried forward with no slackness of coupling. Broad and deep thighs well filled outside and inside, carrying muscles down to hock with an even slope. The breast should be prominent and heart girth big. A moderate width of chest, with good depth is to be preferred to extreme width, coupled with shallowness.

Avoid a lofty horse. Those rangy, upstanding, light-waisted fellows are dashing to look at, but disappointing in every-day use. On the other hand, we sometimes find a bullet-headed, short-necked, thick-bodied, fine-boned, small-footed, light-muscled horse of great weight and abnormally near the ground. He is admirably adapted for the butcher's block, but not for style nor rapidity in his movement nor for staying nor wearing qualities.

A desirable stallion should convey the idea of power in every movement and have nervous force to properly handle that power and be prompt and fearless in all his actions.

After all is said regarding breeding, the prime factor is the man—has he steadiness to spend years in working up to an ideal? Will he take his mares twenty miles in order to find a suitable sire? Will he watch over his mares and spend nights in the stable in order to be on hand at a critical time? Will he feed and care for his young things and delight in seeing them develop under his hand? Has he patience and perseverence enough to break and train his horses properly and fit them for market? One man will take a pair of colts and fit them to sell readily for $450. In the hands of another they would not sell for half that amount.

THE FEEDER TYPE OF A BEEF STEER.

BY W. D. M'KEE, POLO, MO.

That there is as much difference in the quality of beef steak as there is between two mountain ranges, no one will dispute who has experienced the grief and sorrow on the one hand, brought about by trying to eat the tough, dry, lifeless, leathery, substance called steak, as compared with the joy and pleasure of eating the tender, juicy, luscious, richly-marbled article, styled by the lamented L. B. Kerrick as "imperial flesh."

It is held by breeders, feeders, and butchers, as well as professors of animal husbandry, that there are certain fundamental principles underlying the production of the right kind of a steer, the kind so much to be desired.

The steer must have the correct type or conformation. He must be, first of all, bred right. He must carry in his veins the best blood of the beef breeds. Such a steer if properly handled, up to a suitable age to go into the feed lot, will possess certain ear marks, or outward evidences of the profitable kind, that may be observed by an ordinary observer, to say nothing about experts in animal husbandry.

The steer, whether in low condition or high flesh, will possess enough of these external evidences to predict his performance both in the feed-lot and on the block.

This steer will have a wide muzzle, indicating his qualifications as a feeder as well as a grazer. He will be short from the muzzle to the eye, which should be clear, well set out, showing a good quiet disposition. He should have a wide well dilated nostril, giving him breathing capacity, an essential to an ideal feeder. He must be wide between the eyes and horns, or poll if of the polled breeds. If he be wide or strong in that region of the carcass he will almost invariably, have a short, thick neck and a large well formed neck vein, the kind that goes with all good performers in the feed lot. He must have a broad back, with a well arched rib, giving him plenty of room for laying on pounds in the region of the high priced cuts. For it is here that the prime of rib, the porterhouse steak, and the sirloin are to be found. These pieces in the carcass of a steer of the right type will sell for over fifty per cent of the entire carcass, while they may not represent as much as one-third of the dressed weight. Hence, the very great importance of the steer being of the right conformation in the region of the back.

He must have a good strong middle. To make rapid and economical gains he must have a good digestion. He must not be pauchy, for this would indicate too much offal or waste.

He must have a low thick flank. The flank is a cheap piece of meat yet such a flank indicates a deep thick hindquarter when finished.

He must be short from the last rib to the hocks. This indicates a strong short back and goes with a good feeder. He should carry his width well from the hocks to the pin bones, as this will insure a heavy rump steak, a rather high priced piece of meat. The tail head should not be set out too high as it will detract from the appearance of the hind quarters as it hangs in the coolers.

He must have a good strong twist, enabling the butcher to cut steak clear to the hock. This will give width and depth to the hindquarters from whence comes our round steak, considered by some as the choicest part of the beef.

This steer must have a medium fine bone. Such a bone indicates a fine quality of flesh and the ability to fatten young. Without such a quality of bone it is almost impossible to make choice baby beef.

I want to beg the indulgence of my readers at this point to say that there is not enough cattle growers or cattle feeders producing baby beef. I will admit it is quite an art to produce the highest quality of baby beef, but when you do, you have something that will sell for a long price and return to you a good profit for your feed and labor. Without going into a discussion as to the rations necessary to hold this calf flesh on your young steer, or the economy of the gains as compared with the older animal, I have found that the secret in making baby beef lies in your ability to properly finish them.

Do not be afraid of getting them too fat, as they are growing so rapidly this seldom ever happens.

Returning again to the profitable feeder, he must have good handling qualities. He must have a good mossy furry coat of hair. Under such a covering will be found a soft, mellow, thick hide. And beneath this mellow hide will be found, when finished, a deep covering of firm, elastic flesh, such as will entitle the owner to win in the fat stock show, top the market, or sell for Christmas beef.

The steer with the above qualifications may not at all times be the most profitable to buy on the feeder market. But if you are growing steers to feed yourself, or to sell as feeders, you can not afford, on your high priced land, to grow any but the best.

In breeding the class of steers as outlined above, you must have a fixed purpose, select your breed and start with them. Exercise good judgment in selecting your foundation stock, and use nothing but the best individuals of the registered kind.

When you get a sire that has strong prepotency, hold on to him as long as possible, without inbreeding too much.

Remember that men who have begun with common, native cows and used upon these cows and their heifers, sires of some of the pronounced beef breeds, pure in blood and strong in pedigree, have in four or five crosses produced a steer for all practical purposes in the feed lot, equaling those eligible to registry. What others have done so can you.

The farmer or cattle man who desires to produce the ideal feeder need not nor should not pamper his cattle, but good feed has been, and is yet, one of the potent factors in the improvement of cattle, hence he should see that his cattle get feed in such quantities, and of such quality, as to keep them thrifty and growing throughout the whole year.

ANGUS COMPARED WITH OTHER BREEDS.*

BY A. B. CHRISTIAN.

The "Lord hates a coward," and the Angus breeder who will not at all times talk about the merits of this great beef breed, and keep everlastingly at it, it not a worthy member of the association. "Chewing the string" is the proof and the intelligent farmer and stockman who can be induced to handle Angus ever afterward are ready to sound the praises of this breed.

This reminds me of the experience of a York county, Nebraska, farmer. For several years he had fed for market all kinds of cattle and breeds and after each shipment devoted a part of his time to denouncing the "beef trust," claiming that as a rule he would receive only one bid on his cattle, which meant "take it or leave it, you won't get a raise." This farmer for the first time had fed a bunch of grade Angus steers, and feeling so well pleased with the good money he had made, called and related his experience and admitted that when it comes to selling black cattle there is no beef trust, and that the best way to get ahead of the beef trust was to raise and feed Angus cattle.

He said: "Mr. Christian, I have fed your kind of cattle and they took on more meat with less feed than any bunch I have ever fed, and when I had them finished I shipped them to South Omaha, I had no experience selling the blacks and I expected the same old treatment by cattle buyers, in the same old way, that I experienced in the past four years with other breeds which I made myself believe were equally as good and as well finished. When my cattle were being unloaded I saw acres and acres of cattle being unloaded and I said to myself: 'Mary will have to go without the piano this time.' At a considerable distance down the yards I saw cattle buyers riding their horses in our direction, stopping, but not tarrying at any pen. I said to myself, 'Here comes that buyer who will make me one bid and then look at me as if to say: 'Well, why don't you take it, you won't get any better.'

"When they stopped, one said, 'Here are the blacks,' and getting off their horses climbed on the fence and walked around on top. When I took another look over the yards and saw thousands of cattle, it made me mighty blue, and when the first bid was made I thought there was no use; but before I could accept my commission man gave me a nudge. Then an exporter made me another bid and a shipper raised him, and I commenced to think I was at an auction. Well, it took no time to sell my load and that bunch of blacks were the first to go over the scales, topping the market, and 'Mary gets her piano.'"

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*Address delivered before the Nebraska Aberdeen-Angus Breeders' Association, York, Neb.

This experience of one farmer is that of thousands and needs no explanation why Angus cattle are so popular and why they are superior as beef cattle compared with other breeds. Why is it a cattle buyer when riding his horse through stock yard alleys and runs will pass acres of cattle in front, behind and all around him and not make a bid? He has heard from some commission man that there were a decent lot of Angus on hand, and usually before he buys or places a bid he will see the blacks and if they are decent and well fed he will snap them up the first thing. Just ask your commission man.

The butcher, the packer and the retailer will tell you why they prefer the Angus because Angus steers dress the highest per cent of dressed carcass of any beef breed. They prefer it because there is a greater per cent of salable flesh, higher in proportion to the fat carried, and a higher proportion of weight in valuable cuts.

That Angus cattle are adapted to the range has been successfully proven time and again. Colorado short-grass ranch steers won first prize two years in succession at the Kansas City Royal over corn belt farm-raised steers of other breeds. The Angus are sure breeders and their regularity in breeding, their longevity and breeding usefulness to an advanced age are well known. As to their milking qualifications, I could read you columns of statistics showing that as a race of milkers there are families the equal, if not the superior of the dairy and so-called dual-purpose cows of others breeds. When it comes to early maturing the blacks are there with four good black feet, eating regularly full rations which make that even spread of meat and rounds out that conformity which makes the doddie so many times champion of the world.

When you realize that in 1884 millions of people in the United States had never seen an Angus, you wonder at the popularity of this famous breed which, by its merits alone has won its way to the top. In all contest of beef breeds, whether it be at the state fairs or the International, or whether it be in steer, carload, dressed carcass or on the block, the Angus have to their credit the greatest per cent of prizes. Every day in the stock markets of the world this breed is proving its superiority, and the intelligent, progressive farmer and stock man who never knew or cared to learn about any other than the good old breeds are rapidly learning the great merits of this breed.

The blacks are the breed for the farmer on high-priced land, as well as for the ranchman. The farmer is in the cattle business for the money there is in it and is rapidly learning that there is the greatest profit in the hornless and handsome Aberdeen Angus cattle having a stock yard and show beef quality record unrivaled by any other breed.

ECONOMICAL RATIONS IN BEEF PRODUCTION.*

BY H. R. SMITH.

The determination of methods by which beef production can be made more profitable is one of the important problems now under investigation at the Nebraska Experiment Station. During recent years the attractive prices offered for corn by the markets of the world have led many stockmen of the state to discontinue their cattle feeding operations and to sell the crop direct to elevator companies for shipment. Others have turned their attention to pork and mutton production. That beef values have not kept pace with those of corn in the upward trend of recent years is not denied. Nor can it be said that the market quotations for corn-fed beef have been as attractive as the prices offered for finished pork and mutton during the past few years. Nevertheless, cattle feeding has its place, and the industry will be regarded with increasing favor as we learn to more fully appreciate the importance of cattle in their relation to the economic management of our land.

On practically every farm in the state where grain crops have been grown and sold direct to the elevator for a succession of years the soil is much below the productive capacity of adjoining farms where crop rotation and stock feeding have been practiced. Pork production, good so far as it goes in turning back to the land fertilizing material taken from the soil and profitable as it has been during these years of high prices, should not be carried on to the entire exclusion of all other forms of meat production. The occasional destruction of an entire herd of swine by the ravages of cholera is a matter to be considered, but as an argument for a greater diversity of live stock on the farm it does not carry the weight of the one great argument, viz, the economical conversion of a larger part of the vast quantity of roughage grown on every farm as by-products to grain into some marketable commodity. Cattle and sheep feeding not only make possible the utilization of such material, but these ruminants, requiring much bulk as they do, also encourage the growth of more clover and alfalfa in the crop rotation, thus preserving the fertility of the land. Cattle are not only able to consume bulky material in quantity, but they are also able to take it in its crude form, less costly, therefore, than if labor is expended in its preparation.

During the years of low-priced corn, cattle feeding was profitable under almost any system of feeding, but conditions having changed, methods must be varied to meet the new situation. Beef has always been a luxury, and we can hardly expect its rise in value to be commensurate with that of corn and other cereals used in the human dietary. When it becomes excessively high in price the consumers use less meat and more of other foods which, though less palatable, are much cheaper and can serve as substitutes. In beef production, as in other forms of industry, competition forces us to adopt more economical methods, and it is left for the farmer to make beef more cheaply rather than to discontinue the feeding of cattle because of higher priced grain.

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*Bull. 100, Agr. Exp. Station of Nebr. Vol. XX, Art. I.

If cattle feeding, aside from its beneficial effect in maintaining or restoring soil fertility, is still a profitable industry in states farther east —as it is when properly conducted—the farmers of Nebraska are situated to make it doubly so by virtue of the natural conditions which favor the industry here, viz., lower priced corn than any other state in the Union, the possibilities of alfalfa and clover culture, notably the former, favorable markets and shipping facilities, and a climate of relatively low humidity in winter, which permits outdoor feeding. It would be unreasonable to expect cattle to return every year without fail prices for corn above what might have been received at the elevator. The instability of the average stock market would hardly permit it But followed year after year with careful buying and the exercise of skill in the management of cattle, particularly with reference to the selection and use of foods, fair profits are to be depended upon.

Nebraska, relatively speaking, is a newly settled state, the eastern half being occupied by farmers who have been giving most of their attention to the growing and selling of grain. It is not at all surprising, therefore, to find that as the need of stock on the farm is felt mistakes will be made and what might have been profits are really losses. That the Experiment Station might be brought in closer touch with actual conditions as they exist in this state, the writer in the early spring of 1903 visited a large number of feed lots to learn what rations were in common use. In this investigation it was found that by far the largest number were fattening steers on corn and prairie hay, though some were making use of straw, cane or millet as a substitute for prairie hay. In the more central and western portions of the state corn and alfalfa were being fed, while a number in the Missouri river counties were feeding clover. The use of oil-meal and cotton-seed-meal was confined to a few men who feed on an extensive scale and who buy practically all their grain. From the observations made it would be conservative to say that unbalanced rations were being fed on two-thirds of the farms visited. That our farmers might have a practical demonstration of the greater possibilities of a system of cattle feeding which is more nearly in harmony with nature's laws with respect to the character of the food as opposed to a system which ignores entirely the animal's physiological requirements, the series of experiments herein described were conducted under conditions precisely as they may be found on many farms in the state.

PLAN OF EXPERIMENTS.

The steers selected for all experiments were grown under range conditions, having had no grain previous to their purchase. They were chosen for uniformity in age, quality and size as nearly as it was possible to secure it. When the division into lots of ten steers each was made previous to the experimental feeding, an effort was put forth to make the several lots representative of the entire herd so that no one lot would have the advantage of another in weight, quality, condition or age. This would make the several lots of a single winter's experiment comparable, but not the lots fed one winter with those fed another winter. In other words, the reader is not to compare the feed record of 1904-'05 with the feed record of 1905-'06 or any other year. Grade Hereford yearlings from Cherry county, Nebraska, were fed in 1903-'04; Grade Shorthorn two-year-olds from North Park, Colorado, in 1904-'05; Grade Shorthorn and Hereford two-year-olds from Rock county, Nebraska, in 1905-'06, and Grade Angus two-year-olds from Sioux county, Nebraska, in 1906-'07. All lots in every experiment were provided with sheds having large open doors on the south side to permit the steers to go in and out at will, none having horns. The yards were small, but of sufficient size to permit of some exercise. All cattle were given water morning and night and salt was kept before them at all times. Each lot was fed for a preliminary period of approximately three weeks before the records of the experiment were begun in order that all steers might know how to eat grain and furthermore have time to gradually adapt themselves to their respective rations The initial weights of the different lots as tabulated are an average of four weighings made on successive days just before watering in the morning. This is done to reduce as much as possible the element of error often caused by a fill larger one day than another. Every feed was carefully weighed, no credit being given for any coarse roughness left in racks and afterwards thrown out for bedding. This waste was charged to the steers just as though it had been consumed. From what has been said above it may be assumed that the differences in gains as reported in the tables to follow are caused by the rations, at least as largely so as it was possible to make the several lots in a given experiment average uniform in quality and gaining capacity. It is out of the question to eliminate entirely the error which might be caused by individual differences in the gaining capacity of steers even by feeding in lots of ten each. It is for the purpose of making the conclusions more reliable that the same experiments are being continued through a succession of three or more years.

PRAIRIE HAY VERSUS ALFALFA.

Following is a comparison of the feeding value of native prairie hay as it grows in Nebraska, and alfalfa, each being fed as a roughness to supplement heavy corn feeding:

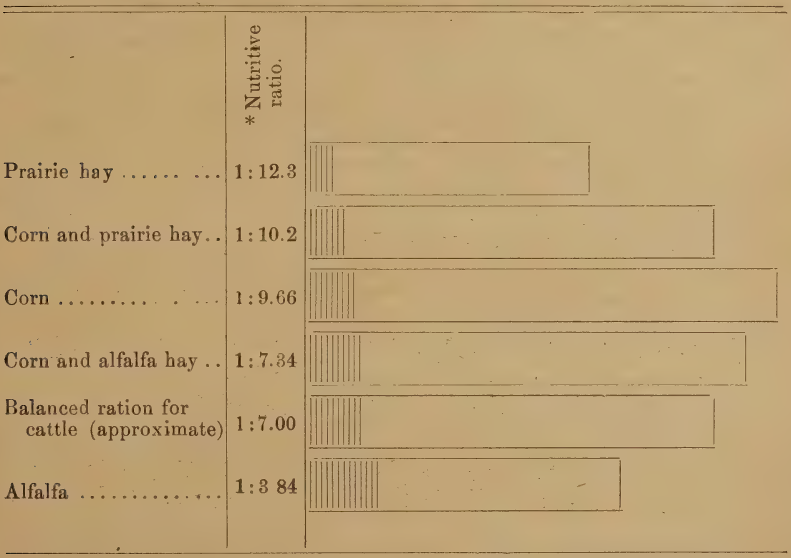
TABLE I.—*Corn and prairie hay versus corn and alfalfa.*

	Yearling steers Dec., '03, to June, '04.—24 weeks.		Two-year-old steers Jan , '05, to July, '05,—24 weeks.		Two-year-old steers Nov., '05, to Feb., '06,—12 weeks.		Average for 3 years.	
	Shelled corn and prairie hay.	Shelled corn and alfalfa.	Shelled corn and prairie hay.	Shelled corn and alfalfa.	*Snapped corn and prairie hay.	Snapped corn and alfalfa.	Corn and prairie hay.	Corn and alfalfa.
Average initial weight per steer, lbs........	801.00	808.00	926.00	937.00	975.00	977.00	901.00	907.00
Average gain per day, lbs..................	1.35	1.97	1.90	2.30	1.20	2.06	1.48	2.11
Average grain fed per day, lbs.............	14.30	15.30	17.90	18.60	9.47	9.47	13.89	14.46
Average hay fed per day, lbs.............	8.70	9.20	9.70	9.20	18.22	22.15	12.21	13.52
Grain consumed per lb. of gain, lbs.......	10.50	7.70	9.52	8.14	7.87	4.60	9.29	6.81
Hay consumed per lb. of gain, lbs..........	6.50	4.70	5.19	4.02	15.16	10.75	8.95	6.49
Total food consumed per lb. of gain, lbs.......	17.00	12.40	14.71	12.16	23.03	15.35	18.25	13.30
Cost of 100 lbs. gain....	$8.27	$6 04	$8.23	$6.89	$8.76	$ .49	$8.32	$6.29
† Profit or loss per head, including pork produced from droppings............ ...	Profit $30.8	Profit $8.66	Loss $1.13	Profit $2.86	Loss $0.08	Profit $3.56	Loss $0.27	Loss $5.02

* Snapped corn is the ear within the husk or shuck. The figures in the table are its shelled corn equivalent.

† In computing profits all items of expense were included except the labor of feeding which is customarily figured as an offset to manure made.

It is never safe to accept as definite the conclusions drawn from a single experiment, but when we have, during a succession of three years, the marked contrast in daily gains, cost of production, and net profits in favor of alfalfa as compared with prairie hay, which the above table indicates, there would seem to be little room to doubt the superiority of alfalfa when each is fed with corn alone. There may be several reasons for this. Perhaps first in importance is the fact that alfalfa is a legume, having, like clover and cowpeas, the power to take nitrogen from the air, storing it within its cellular structure in the form of proteids, which material is needed by the animal in the formation of lean tissue and bone. Alfalfa in itself contains more protein than the average fattening animal requires, an excess sufficient to compensate for that lacking in corn, the two together, therefore, making a balanced ration for fattening cattle. Prairie hay, like corn, lacks protein and when fed singly or together they do not supply enough of that nutrient to meet physiological requirements. This is best shown by examining the following chart, the black lines representing the digestible protein (lean formers) of each food and the white the digestible carbohydrates (starches, etc.) and vegetable oils both of the latter producing animal fat and body heat. What is approximately a well-balanced ration for the average two-year-old steer is indicated by the line having the nutritive ratio 1:7, by which is meant one pound of protein to seven pounds of carbohydrates and fats. It will be noted how closely the ration corn and alfalfa—two pounds of the former to one of the latter—approaches this proportion. In fact, we are not sure but that 1:7.3 is just as suitable as 1:7 for an average two-year-old steer. The corn and prairie hay combination, however, is decidedly lacking in protein, which is no doubt one of the chief causes of its failure as an economical ration.



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* This chart is based on the average composition and digestibility of the foods indicated as determined at numerous places. The nutritive ratio is found by multiplying the digestible fats by 2¼, adding this to the digestible carbohydrates and dividing the sum by the digestible protein.

But the composition of a food is not the only factor which determines its value. Alfalfa is very much more relished than prairie hay and it is less difficult to masticate. Steers crowded for the largest possible consumption of grain can also be induced to eat a little more corn with alfalfa than with prairie hay.

In determining the cost of producing 100 pounds of gain, alfalfa and prairie hay were figured at $6 each per ton for the three years. Corn was 33 cents per bushel in 1903, 39 cents in 1904, and 35 cents in 1905. It is unfair to make comparative values of a roughage like alfalfa, which balances well with corn alone, and one like prairie hay which does not, but when thus fed as in these three experiments, the alfalfa returned values ranging from $10.80 to $15.70 per ton as compared with prairie hay at $6. The experiments show, however, that we cannot afford to feed prairie hay at $6 per ton even if we include in the profits all pork made from droppings, as was done in these computations; at least we cannot afford to do so if corn alone makes up the grain ration. Referring to the net profits per head as given in the table it is of interest to know that the net advance of selling over cost price for the twenty-four weeks periods was $1.30 per hundred on the corn and prairie hay steers in 1903 and $0.78 in 1904, while the advance on the alfalfa steers was $1.65 per hundred in 1903 and $1 in 1904. The larger advance received for the alfalfa steers was no doubt due to the higher finish made by those steers. It is apparent that good profits can be made by feeding corn and alfalfa even though the selling price of the cattle does not greatly exceed the cost price. In these experiments the feeding of alfalfa at $6 per ton with corn made this grain bring, when converted into beef, 51 cents per bushel in 1903, 44 cents in 1904, and 60 cents in 1905. It would take a larger advance than our markets usually afford to make corn and prairie hay profitable at the prices for corn and cattle which have prevailed during the past few years.

Clover was not fed in this series of experiments, but because it is similar to alfalfa in composition, though somewhat lower in protein, it would not be unreasonable to expect good gains on corn and clover; and experiments made in other states show favorable results for this combination of foods. With any other form of roughness with the exception of cowpea hay, which is also a legume, we would hardly expect satisfactory gains unless some protein concentrate is fed with corn.

THE USE OF CORN-STOVER WITH CORN AND ALFALFA.

From the experiments already described it is apparent that a ration of corn and alfalfa is capable of producing large and profitable gains, enough so to make corn bring more in the form of beef than as a cash crop. But with corn there is also the stalk upon which it grew. Do not these stalks grown in such large quantity on our corn land possess sufficient nutritive value to make it worth while to harvest them for feeding purposes? Left standing in the field they become woody and useful only as winter forage for stock cattle and horses, their value being estimated at from 25 cents to $1 per acre, a price not to exceed 50 cents per ton. When cut and put in shocks immediately after the corn ripens they remain fairly green, retain in the leaves the nutritive properties which they possessed when harvested and are much relished even by cattle on a full grain feed. For the purpose of securing data upon the above question two experiments were conducted in which the ration corn and alfalfa was compared with corn, alfalfa and stover (stalks without the ears). The stover was fed unshredded in racks provided with vertical slats only wide enough apart to permit the steers to enter their heads, thus preventing the stalks from being pulled out and trampled under foot. The coarse butts refused, approximately 40 per cent of the stalks fed, were thrown out for bedding purposes, but charged to the steers as feed consumed. The stover was fed each morning in order that the steers might have the entire day to work over the stalks, and the alfalfa was fed only at night to those lots receiving stover. Following is the record of the steers—ten two-year-olds in each lot—fed as indicated:

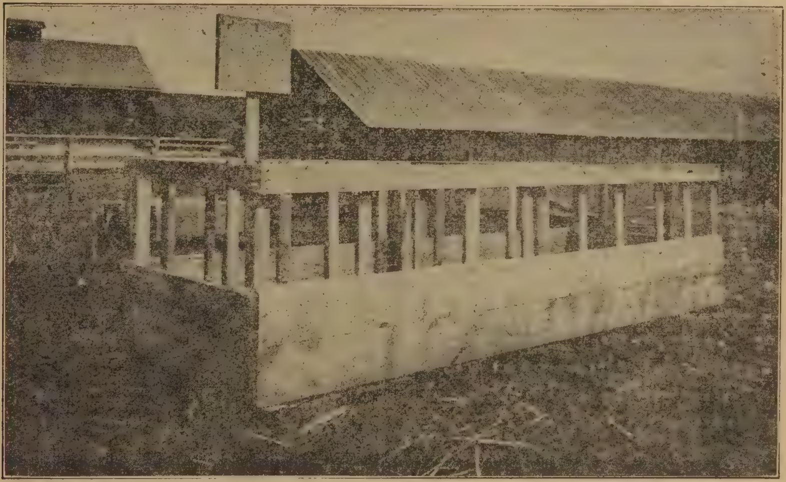

FIG. 1.—Rack for feeding corn fodder or stover.

TABLE II.—*Corn and alfalfa versus corn, alfalfa and corn-stover.*

	Jan., '05, to July, '05,—24 weeks.		Nov., '05 to Jan., '06,—12 weeks.		Average of the two experiments.	
	Shelled corn and alfalfa.	Shelled corn, alfalfa and corn-stover.	Snapped corn and alfalfa.	Snapped corn, alfalfa and corn-stover.	Corn and alfalfa.	Corn, alfalfa and corn-stover.
Average initial weight per steer, pounds	937.00	941.00	977.00	974.00	957.00	957.00
Average gain per day, pounds	2.30	2.40	2.06	1.96	2.18	2.18
Average grain fed per day, pounds	18.60	18.40	9.47	9.61	14.03	14.00
Average roughness fed per day, pounds	9.20	9.90	22.15	22.45	15.67	16.17
grain consumed per pound of gain pounds	8.14	7.89	4.60	4.90	6.37	6.39
Roughness consumed per pound of gain, pounds	4.02	4.56	10.75	11.44	7.38	8.00
Total food consumed per pound of gain, pounds	12.16	12.45	15.35	16.34	13.75	14.39
Cost of 100 pounds of gain	$6.89	$6.49	$5.49	$5.01	$6.45	$6.05
Net profit per head, including pork	$2.86	$3.32	$3.56	$4.20	$3.21	$3.76

The table shows that in the first experiment equal parts of alfalfa and stover produced a slightly larger daily gain than alfalfa fed as the sole roughness with shelled corn. In the second experiment, when snapped corn was used, the reverse was true. A ration consisting of corn and alfalfa is often too laxative, especially wth the later cuttings of alfalfa. In the first experiment it is very probable that the stover lessened the tendency to scour, while in the second experiment the presence of husk and cob served the same purpose. There may have been also some advantage in having stover with alfalfa for variety. In this connection it may be said that prairie hay will answer these purposes, but prairie hay ordinarily costs as much as alfalfa, so there is but little adantage in using it. In both the experiments tabulated above, the use of corn-stover at $2.50 per ton as half the roughness reduced the cost of gains—in the first 40 cents per hundred, and in the second 48 cents. The stover proved to be actually worth $3.55 per ton with snapped corn and $4.16 per ton with shelled corn, worth 39 cents per bushel, as compared with alfalfa fed alone at $6 per ton. Nebraska produced last year, in round numbers, eight million tons of corn-stover. If one-fourth of this amount could have been converted into beef, bringing but $2.50 per ton as fed from the shock instead of 50 cents in the stalk fields, four millions of dollars could have been added to our earnings, and no losses from cornstalk disease would have come from feeding the stalks thus harvested.

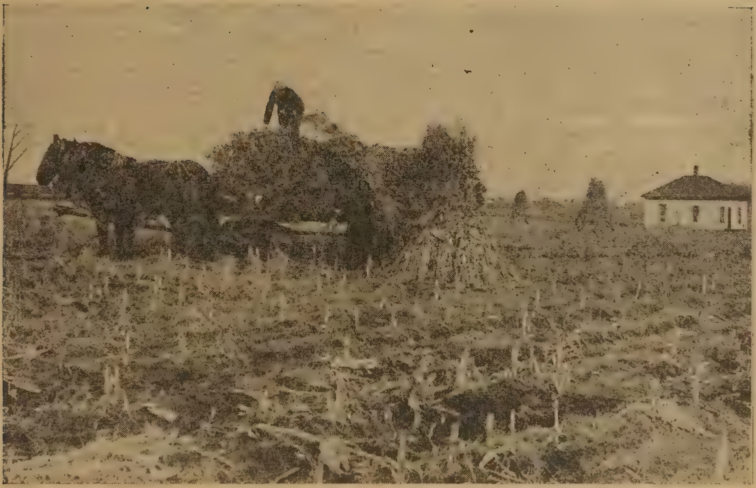

FIG. 2.—Hauling bundles of corn fodder in late winter.

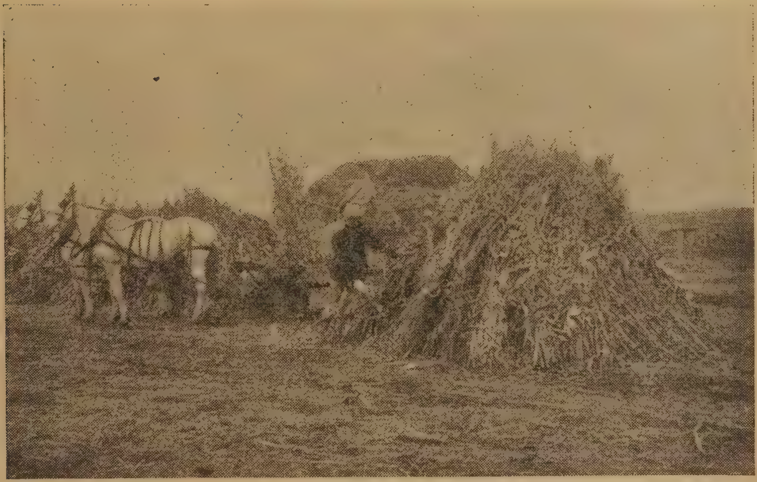

FIG. 3.—Building bottom of round stack for spring feeding. Next tier of bundles should be flatwise with all heads touching at center.

FEEDING CORN FODDER (ENTIRE PLANT).

The objection that is usually raised against the practice of cutting and shocking corn for feeding purposes is the labor involved in husking it from the shock. The fact that a great deal of corn may be fed to cattle in the stalk unhusked is entirely overlooked. In a 1905-'06 experiment one lot of ten two-year-old steers was fed corn fodder for a period of twelve weeks in comparison with the same amount of snapped corn and stover fed another lot. Two-thirds of all the corn given the one lot was attached to the stalk, the remainder consisting of shelled corn fed at night. Charging four cents per bushel for husking, the cost of gains was the same in both lots. In 1906-'07 this comparison was again made and half of all the corn fed was attached to the stalk. Here again the cost of production was practically the same, being only 10 cents per hundred less for snapped corn. The feeding of corn on the stalk in the morning with shelled corn and alfalfa hay at night is proving to be a very economical system of beef production, and it may be continued throughout the entire period by stacking the bundles near the feed yards for use in late winter. For such purposes corn which has been drilled a little thicker than usual is best because the ears are somewhat smaller, though it should not be planted so thickly that the yield of corn will be reduced. By feeding corn fodder we utilize the stalk and yet are put to no extra labor husking it. In fact, corn can be cut with a harvester and put in the shock cheaper than it can be picked and cribbed, inasmuch as three men with a team and a harvester can cut and shock seven acres per day. Records from the Farm Department of this Experiment Station show that it costs $1.18 per acre to cut and shock corn, which figure does not allow for wear and tear on the machine. Three cents per bushel should cover the cost of harvesting corn with a machine and putting it in shocks, in which form it may be fed direct to the cattle.

CORN AND PRAIRIE HAY VERSUS CORN, LINSEED-MEAL AND PRAIRIE HAY.

On many farms alfalfa or clover is not available in sufficient quantity to form even half of the roughness supplied fattening cattle. Under these circumstances the use of some commercial protein concentrate would seem desirable. In order that this might be given a practical test, three experiments were conducted in which the ration corn and prairie hay was fed with and without the protein concentrate linseed-meal (oil-meal). The latter food was made but 10 per cent of the grain ration because of its high protein content and relative cost. In this experiment, as in all other experiments described in this bulletin, ten steers were fed in each lot. For the purpose of making the results more easily comprehended by the reader, the tables are made to show the average record for each steer by lot.

TABLE III.—*Corn and prairie hay versus corn, linseed-meal and prairie hay.*

	Dec., '03, to June, '04,—24 weeks.		Jan., '05, to July, '05,—24 weeks.		Feb., '06, to April, '06,—8 weeks.		Average of the three experiments.	
	Shelled corn and prairie hay.	Shelled corn 90%, oil-meal 10%, and prairie hay.	Shelled corn and prairie hay.	Shelled corn 90%, oil-meal 10%, and prairie hay.	Shelled corn and prairie hay.	Shelled corn 90%, oil-meal 10%, and prairie hay.	Shelled corn and prairie hay.	Shelled corn 90%, oil-meal 10%, and prairie hay.
Avearge initial weight, per steer, lbs.	801.00	799.00	926.00	934.60	1176.00	1187.00	967.00	973.00
Average gain per day. lbs	1.35	1.91	1.90	2.10	1.27	2.52	1.51	2.18
Average grain fed per day, lbs	14.30	15.40	17.90	19.40	19.10	24.60	17.10	19.80
Average hay fed per day, lbs.	8.70	8.80	9.70	9.50	5.50	6.80	7.90	8.40
Grain consumed per lb. of gain, lbs	10.50	8.10	9.52	9.06	15.10	9.77	11.71	8.98
Hay consumed per lb. of gain, lbs.	6.50	4.60	5.19	4.30	3.94	2.70	5.21	3.87
Total food consumed per lb. of gain, lbs.	17.00	12.70	14.71	13.36	19.04	12.47	18.92	12.84
Cost per 100 lbs. of gain.	$8.27	$6.82	$8.23	$8.27	$10.74	$7.87	$8.52	$7.61
Net profit or loss per head including pork from droppings.	Profit $0.38	Profit $4.76	Loss $1.13	Profit $1.09	Loss $0.46	Profit $1.43	Loss $0.40	Profit $2.43
Nutritive ratio	1:10.4	1:8	1:10.2	1:8	1:10	1:8	1:10.2	1:8

That linseed-meal is capable of supplying what corn and prairie hay lacks is readily apparent when we note the marked increase in daily gains effected by its use. Each year the steers fed linseed-meal took on a more thrifty appearance, as indicated by the coat of hair a few weeks after the experiments were begun. They ate their grain with greater relish and when on full feed consumed somewhat more grain, which of course partly accounts for the increased gains. This was especially noticeable in the short period of heavy grain feeding in 1905-'06, when the steers were crowded with grain throughout that entire period, the oil-meal steers taking 5.5 pounds of grain per day in excess of the lot not receiving it. However, in the two previous experiments when both lots were purposely kept on the same amount of grain per day for the first three months, the linseed-meal steers, particularly the yearlings in 1903-'04, gave much larger gains. It will be noted also that much less grain was required to make a pound of gain each year, the average for the three years being 23 per cent less. This is equivalent to saying that four pounds of corn with linseed-meal produced as much beef as five pounds without linseed-meal. With corn averaging 35.7 cents per bushel and linseed-meal $28.33 per ton for the three years, the cost of producing one pound of gain was 10.7 per cent less by the use of the linseed-meal. The experiments show the urgent need of some protein concentrate with corn and prairie hay, provided its cost is not too great. Had the average cost of the linseed-meal been $45 or more per ton for the three years, there would have been no advantage in using it.

PROTEIN CONCENTRATES COMPARED

Having shown the importance of using with corn and prairie hay a small quantity of some protein concentrate, in this case linseed-meal, we next compare three protein foods commonly sold in Nebraska, viz., wheat bran, linseed-meal and cottonseed-meal. Gluten feed, a by-product in the manufacture of starch, glucose, etc., from corn, would have been included in these tests if the cost of freight from eastern factories were not such as to make the price of this food prohibitive for stock feeding purposes here. Just as soon as starch and glucose are manufactured in quantity in this section, gluten feed will no doubt become a formidable competitor of the protein foods mentioned. Owing to the lower protein content of wheat bran, this food was made 22 per cent of the grain ration, whereas linseed-meal and cottonseed-meal were each made 10 per cent of the grain ration. It will be noted in the table to follow that the basic part of each ration in the first experiment was corn and prairie hay, while in the second it was corn and corn-stover.

TABLE IV.—*Wheat bran versus linseed-meal versus cottonseed-meal.*

	Feb., '06, to Apr., '06,—8 weeks.			Nov., '06, to Apr., '07,—20 weeks.		
	Shelled corn 75%, bran 25%, prairie hay.	Shelled corn 90%, oil-meal 10%, prairie hay.	Shelled corn 90%, cotton-seed-meal 10%, prairie hay.	Corn 78%, bran 22%, corn-stover.	Corn 90%, oil-meal 10%, corn-stover.	Corn 90%, cotton-seed-meal 10%, corn-stover.
Average initial weight per steer, lbs.	1146.00	1187.00	1154.00	973.00	976.00	988.00
Average gain per steer per day, lbs.	1.98	2.52	2.29	1.76	2.33	2.11
Grain consumed per steer per day, lbs.	25.20	24.60	24.60	24.97	23.02	22.83
Average roughage consumed per steer per day, lbs.	5.50	6.80	6.20	8.91	8.96	8.89
Grain consumed per pound of gain, lbs	12.97	9.77	10.77	14.19	9.88	10.83
Roughage consumed per lb. of gain, lbs.	2.78	2.70	2.72	5.06	3.85	4.21
Total food consumed for 1 lb. of gain, lbs.	15.75	12.47	13.49	19.25	13.73	15.04
Cost of 100 lbs. of gain	$9.31	$7.87	$8.59	$10.49	$7.64	$8.26
Value of pork produced as a by-product for 100 lbs. of gain on steers	1.00	0.84	0.68	2.30	1.31	1.68
Net cost of food per 100 lbs. of gain	8.31	7.03	7.91	8.19	6.33	6.58
Net profit or loss per head, including pork	Profit $0.57	Profit $1.43	Profit $0.47	Loss $3.94	Profit $1.65	Profit $1.32
Nutritive ratio by lots	1:8	1:7.3	1:6.8	1:8.8	1:8.2	1:7.6

In both of these experiments bran gives a much smaller daily gain than either linseed- or cottonseed-meal. In order to furnish the desired amount of protein, it was necessary to feed from five to six pounds per day to each steer, which quantity of this food, rather laxative in its effects, caused the steers to scour both winters. Several steers in the bran lot became more or less rheumatic or stiff. This was also observed both winters, but it was more pronounced in the second trial. No doubt these difficulties were partly responsible for the unsatisfactory gains on corn and bran, as no other lots were similarly affected. The bran put on the market today is apparently less valuable than formerly, no doubt because of its high crude fibre content due to modern methods of milling, which effect a more complete extraction of the valuable portions of the wheat kernel.

While cottonseed-meal is slightly higher in protein than linseed-meal, the latter gave the larger gains in both these experiments, though the difference was not great. The cattle did not eat the mixture of corn and cottonseed-meal with the same relish that was conspicuous when the ration corn and linseed-meal was placed before them, and this no doubt furnishes one explanation of the superiority of linseed-meal in producing not only larger daily gains but also larger gains from the same weight of food. The feeds used in the first experiment cost as follows: corn 35 cents per bushel, bran $15 per ton, linseed-meal $32 per ton, and cottonseed-meal $32 per ton. Those used in the second experiment cost as follows: corn 36 cents per bushel, bran $18 per ton, linseed-meal $29.50 per ton, cottonseed-meal $27.75 per ton, and stover $2.50 per ton. The prices given for commercial foods are on the basis of car lots f. o. b. Lincoln. At the above prices it will be noted that the cost of producing one pound of gain was much greater with bran than either of the other protein foods. In the first experiment the linseed-meal proved to be three times as valuable as bran. The difference was even greater in the second experiment. It would not be wise, however, to place any relative values upon these foods until after further tests are made.

In examining the above table it is interesting to note that the gains made in the second experiment, where corn-stover was used as the roughness, compared favorably with those made in the first experiment, on prairie hay. We cannot, however, formulate any estimate of the relative values of the two forms of roughness from the above table, because the first experiment was of only eight weeks' duration, during the finishing period, while the second test lasted twenty weeks, practically the entire fattening period. Furthermore, grade Shorthorns were used in the first experiment and grade Angus in the second.

LINSEED-MEAL (A PROTEIN CONCENTRATE) COMPARED WITH ALFALFA (A PROTEIN ROUGHAGE).

The two experiments with protein concentrates conducted to date favor the use of linseed-meal as a food supplementary to corn when the roughness consists of either prairie hay or corn-stover. The question now arises, would it be possible to supply sufficient protein by making half of the roughness alfalfa, dispensing with the use of the concentrate, and still be able to secure just as satisfactory gains? This would make it possible to utilize a great deal of stover or prairie hay and at the same time obviate the necessity of purchasing the commercial food. Two experiments in which the ration corn and linseed-meal was compared with corn without such a food when alfalfa forms half the roughness are here reported.

TABLE V.—*Linseed-meal versus alfalfa.*

	Feb., '06, to Apr., '06,—8 weeks.		Nov., '06, to Apr., '07,—20 weeks.	
	Corn 90%, linseed-meal 10%, and prairie hay.	Corn 100%, alfalfa hay and prairie hay (equal parts).	Corn 90%, linseed-meal 10%, and corn stover.	Corn 100%, alfalfa hay and corn stover (equal parts).
Average initial weight per steer, lbs....	1187.00	1164.00	976.00	978.00
Average gain per steer per day, lbs....	2.52	2.29	2.33	2.42
Grain consumed per steer per day, lbs..	24.60	23.20	23.02	22.33
Roughage consumed per steer per day, lbs..........................	6.80	8.10	8.96	9.77
Grain consumed per lb. of gain, lbs....	9.77	10.16	9.88	9.22
Roughage consumed per 1 lb. of gain, lbs.	2.70	3.55	3.85	4.03
Total food consumed for lb. of gain, lbs..............................	12.47	13.71	13.73	13.25
Cost of 100 lbs. of gain................	$7.87	$7.40	$7.64	$6.99
Value of pork produced as a by-product for 100 lbs. of gain on steers........	0.84	1.07	1.31	1.53
Net cost of food per 100 lbs. gain......	7.03	6.33	6.33	5.46
Net profit per head, including pork produced from droppings..........	1.43	2.53	1.65	6.38
Nutritive ratio.........................	1:7.3	1:8.7	1:8.2	1:8.7

In the matter of daily gains, the linseed-meal seems to have the advantage in the first experiment with prairie hay, and the alfalfa in the second experiment with corn-stover. An average gain of two pounds per day for an entire fattening period is ordinarily considered good. The gains made on both rations in the two experiments reported are therefore very gratifying, particularly the average gains made for a period of twenty weeks in the second experiment. The fact that one lot of ten two-year-old steers gained 2.33 pounds each day for a period of five months with unshredded corn-stover for roughness and no hay of any kind, is added proof of the high feeding value of this by-product so commonly wasted in Nebraska.

While the linseed-meal ration shows its superiority over the alfalfa combination in making larger daily gains during one experiment, the use of alfalfa without linseed-meal made the gains less costly in both. The alfalfa-fed steers in the first experiment sold for the same price per hundred as the linseed-meal steers. In the second experiment the alfalfa steers sold for $5.65 per hundred, while the linseed-meal steers sold for $5.50 the same day, which difference may have been due to the quality of the individuals at the beginning of the test and not to the feed.

With corn costing 35 cents per bushel and prairie hay $6 per ton, the alfalfa hay proved to be worth $13.11 per ton in comparison with linseed-meal costing $32 per ton. In the second experiment, with corn worth 36 cents per bushel and stover valued at $2.50 per ton, the alfalfa returned a value of $13.12 per ton in comparison with linseed-meal at $29.50. From these figures it is apparent that alfalfa possesses a high value as a source of protein. The experiments furthermore suggest that a relatively small quantity of this hay will supply sufficient protein to insure good gains on two-year-old steers, and that this can be produced on the farm much cheaper than it can be purchased on the market in the form of linseed-meal or some other protein concentrate.

PRAIRIE HAY VERSUS CORN-STOVER.

In the comparison of linseed-meal and alfalfa, first when used with corn and prairie hay, and second with corn and stover, the reader is not to draw any conclusions as to the relative values of prairie hay and stover, because they were fed during different years under dissimilar conditions. Following is a direct comparison of these two forms of roughness, one year with linseed-meal supplementing the corn, another year with alfalfa forming half the roughness with each, and a third comparison with each roughness fed with corn alone:

Table VI.—*Prairie hay versus corn-stover.*

	Dec., '03, to June, '04,—24 weeks.		Nov., '05, to Jan., '06,—12 weeks.		Nov., '05, to Jan., '06,—12 weeks.	
	Corn 90%, oil-meal 10%, and prairie hay.	Corn 90%, oil-meal 10%, and corn-stover.	Snapped corn, prairie hay and alfalfa.	Snapped corn, corn-stover and alfalfa.	Snapped corn and prairie hay.	Snapped corn and corn stover.
Average initial weight per steer, lbs.	799.00	777.00	979.00	74.00	975.00	976.00
Average gain per steer per day, lbs	1.91	1.96	2.01	1.96	1.20	1.02
Average grain consumed per steer per day, lbs.	15.40	15.60	9.47	9.61	9.47	9.47
Roughage consumed per steer per day, lbs.	8.80	11.20	21.10	22.45	18.22	22.86
Grain consumed per pound of gain, lbs	8.10	8.00	4.70	4.90	7.87	9.25
Roughage consumed per pound of gain, lbs.	4.60	5.70	10.47	11.44	15.16	22.44
Total food consumed per pound of gain, lbs.	12.70	13.70	15.17	16.34	23.63	31.69
Cost of food for 100 pounds of gain	$6.82	$6.09	$5.47	$5.01	$8.76	$8.11
Nutritive ratio	1:8	1:8.3	1:7.2	1:7.3	1:11	1:13.1

When balanced rations were fed, the protein being furnished in one experiment by the use of linseed-meal and in the other by alfalfa hay, the corn-stover made a favorable showing with prairie hay, proving to be worth in the first $4.23 per ton and in the second $5.17 per ton compared with prairie hay at $6 per ton. In the third comparison, without a protein food, the stover returned a value of but $2.77 compared with prairie hay at $6, which smaller value is perhaps attributable to the lower protein content of stover. As already stated, not more than 60 per cent of the stover charged to the steers fed in these experiments was consumed, the remainder consisting of refuse butts which had to be thrown out for bedding. The stover actually consumed would seem to possess a feeding value quite the equal of prairie hay. Inasmuch as corn-stover contains only 60 per cent dry matter, while prairie hay is approximately 90 per cent, it would seem conservative to say also that the dry matter of the entire cornstalk with ear detached, cut immediately after the corn ripens and properly cured in shock, is equal to the dry matter of prairie hay.

THE RELATIVE ECONOMY OF A HEAVY AND LIGHT RATION OF CORN.

The experiments so far conducted and reported in these pages indicate that beef can be produced most economically in Nebraska by the use of corn, alfalfa, and corn-stover. It would seem proper to next determine, if possible, what proportion of corn to such roughness is most economical. Corn has ruled high in price during the past few years, while roughness of all kinds has remained relatively low in value until the last year, when hay has been abnormally high because the dry weather which prevailed throughout the country during the early part of the summer caused a shortage in this crop, the effect of which will no doubt be but temporary. The cost of hauling and shipping hay and other bulky feed is such as to make it seem probable that the price of roughness on our Nebraska farms, many of them situated some distance from stations, will not advance with corn in the future. Beef cattle in the west are ordinarily fed all the grain they will consume, very commonly by the use of self-feeders, having before them what rough feed is needed to satisfy the craving for bulk. The latter is often of very inferior quality, perhaps a stack of wheat straw, and a very limited quantity is consumed. That a good quality of roughness can be made to take the place of a part of the corn is shown by the following single experiment conducted the past winter:

TABLE VII.—*Heavy versus light feed of corn with alfalfa and corn-stover.*

	Nov., '06, to Apr., '07,—20 weeks.	Nov., '06, to May, '07,—24 weeks.
	Corn, (heavy feed), alfalfa hay 50%, corn-stover, 50%.	Corn (light feed), alfalfa hay, 60%, corn stover 40%.
Average initial weight per steer Nov. 14, lbs	978.00	977.00
Average gain per steer, 5 mos. for lot 4, 6 mos. for lot 5, lbs	339.00	339.00
Average gain per steer per day, lbs	2.42	2.01
Average grain consumed per steer per day, lbs	22.33	13.89
Average roughage consumed per steer per day, lbs	9.77	18.08
Average grain consumed for each lb. of gain, lbs	9.22	6.91
Average roughage consumed for each lb. of gain, lbs	4.03	8.96
Average cost of 100 lbs. of gain	$6.99	$7.06
Value of pork produced as a by-product for 100 lbs. of gain on steers	1.53	1.44
Net cost of food for each 100 lbs. of gain	5.46	5.62
Profit per steer, including pork produced from droppings	6.38	4.61
Nutritive ratio	1:8.7	1:7.3

The steers on the light ration of corn were never given to exceed fourteen pounds of corn per day, the average daily ration for the twenty-four weeks being 13.89 pounds, while the full-fed steers were given as high as 24 pounds per day, an average of 22.33 pounds for the period of twenty weeks fed. The light fed steers consumed as much more roughness as the heavy fed steers consumed more corn.

It is interesting to note that the ten steers on the light grain ration made the same gain in six months (24 weeks) that the heavy fed steers made in five months (20 weeks). The light fed steers were equally well finished with the extra month's feeding and sold at $5.50 per hundred, the top of the South Omaha market May 14, 1907, when there was a heavy run of cattle. The heavy fed cattle sold for $5.65 April 16, one month previous, when the market was 20 cents per hundred higher, as found by averaging the selling price of the top hundred steers April 16 and the same number May 14. In computing the net profits in the above table, both lots were figured at $5.38 per hundred net, the price received for the heavy fed cattle on home weights at the close of the experiment. At last winter's (1906-'07) prices on feeds, viz., shelled corn 36 cents per bushel, snapped corn 35 cents, alfalfa hay $8 per ton, and stover $2.50 per ton, the heavy fed steers produced gains at a net cost (deducting pork from droppings) of $5.46 per hundred compared with $5.62 for the light fed steers. Had the alfalfa hay cost $5 per ton instead of $8—and alfalfa in the stack on the average farm of Nebraska does not usually command a figure greater than $5—the net profits per steer would have been the same in both lots. This would have been true also if the corn had cost 50 cents per bushel instead of 35 cents, figuring the alfalfa at $8. This experiment emphasizes further the value of alfalfa as a beef producer, and it opens a new and important field for future investigation. The record made by the light fed cattle was no accident, as another lot in a corn fodder experiment made very nearly as large gains on the same grain ration. No conclusions, however, are to be drawn until after further tests along this line are made. As a single experiment it suggests the possibility of producing beef most economically on what approaches a full grain feed when corn is low in price and alfalfa high. When corn is high and alfalfa low, something more like half a full feed of grain would make beef production more profitable even though more time is required to finish the cattle. Judging from the results of the above experiment, it is probable that the most economical proportion of grain to hay under average conditions will be found somewhere between a half feed and a full feed of grain. Nothing definite, however, will be known until after several tests are made in which different quantities of grain are fed.

Fig. 4.—Angus steers as they appeared on the range when purchased. Photo by Morrill Geological Expedition.

THE 1906-'07 EXPERIMENTS.

The sixty steers used in last winter's experiments were purchased in October, 1906, from Mr. James Cook of Agate, Sioux county, Nebraska. They were high-grade Angus two-year-olds selected from a herd num-

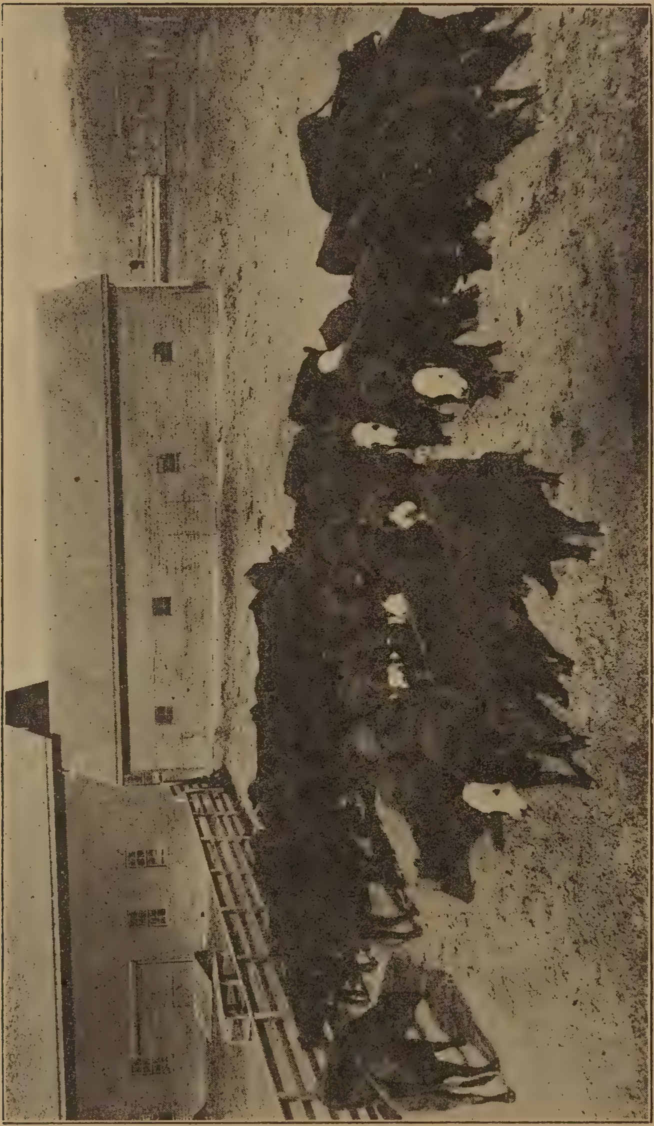

FIG. 5.—Angus steers as they appeared at the beginning of the experiment.

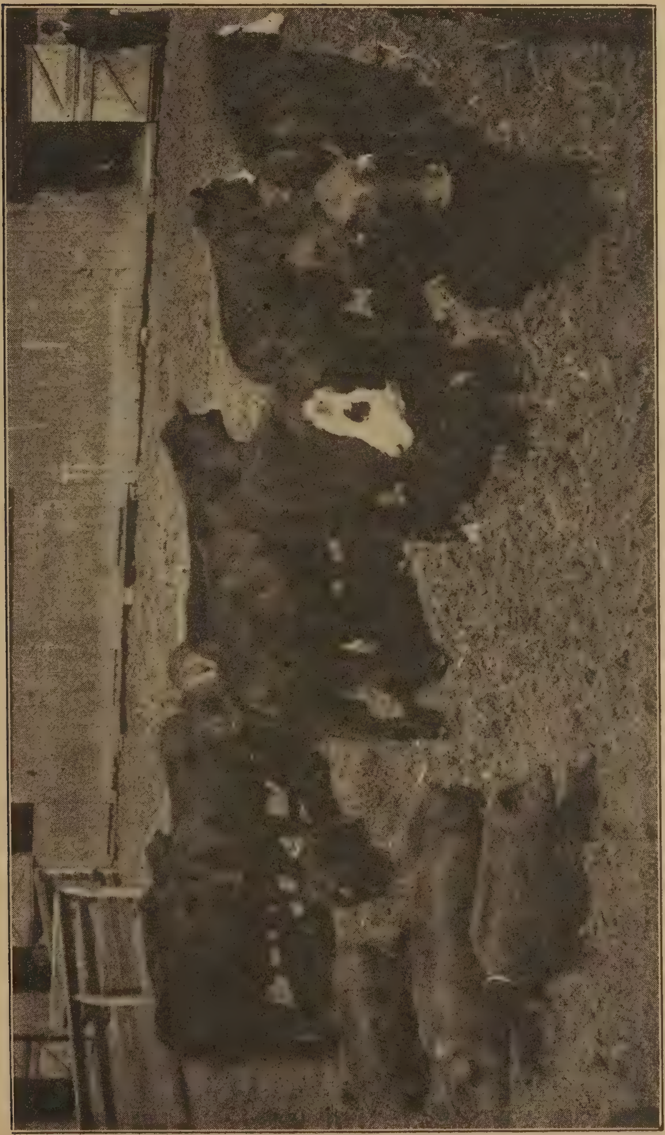

FIG. 6.—Lot 1, on corn, wheat bran and corn stover, as they appeared at the close of the experiment, April 3, 1907.

bering about two hundred, all reared under range conditions, having had, previous to their purchase, nothing but grass supplemented with native hay during the winter months. They were in what would be considered good grass flesh when purchased, and no doubt would have sold at top values for feeder steers had they been sent to market. These steers cost $4 per hundred at the ranch and were weighed after having been yarded twenty-four hours without feed and water. The steers were shipped during the time of the severe October snowstorm and the shrinkage was very heavy. This shrinkage with the freight across the state and the expense of three weeks' preliminary feeding made the steers cost net November 14, on the initial weights of the experiment, 4.58 cents per hundred as given in the Financial Statement to follow.

All steers were yarded at the Experiment Station October 26, 1906, and given a liberal feed of hay and but little grain. Owing to the fact that they had never been fed grain it was necessary to sprinkle corn-meal over the hay in order to get them started. They immediately acquired a fondness for corn-meal and a few days later for shelled and snapped corn, the feed being increased from one pound of meal per steer the first day to four pounds of shelled and snapped corn per day by the end of the first week, November 2. By November 14, when the records of the experiment were begun, the steers in lots 2 and 3 were each receiving 7.8 pounds of snapped corn in the morning and 6 pounds of the mixture of shelled corn and linseed- or cottonseed-meal at night, the equivalent of 12 pounds of grain per day. Owing to the bulky character of bran, which formed about one-fourth of that ration, lot 1 was purposely given a little larger feed of grain to make the quantity of corn correspond more nearly to that fed lots 2 and 3, which received linseed- and cottonseed-meal, forming but 10 per cent of the daily grain ration. On December 12 the ten steers in lot 1 received 146 pounds of snapped corn in the morning and 84 pounds of shelled corn and 55 pounds of bran at night. The ten in lot 2 received 146 pounds snapped corn in the morning and 89 pounds shelled corn and 22 pounds of linseed-meal at night. Lot 3 received the same ration except that cottonseed-meal was substituted for linseed-meal. On that date, therefore, each steer in lots 2 and 3 was receiving the equivalent of 19.8 pounds of shelled corn and 2.2 pounds of the linseed- or cottonseed-meal, while each steer in lot 1 received the equivalent of 19.3 pounds of shelled corn and 5.5 pounds of bran. Lot 4 was fed the same quantity as lots 2 and 3, the grain being corn alone. These four lots were given all the grain they would consume during the last three months of the experiment, an average of about 25 pounds to each steer per day. Lots 5 and 6 were never increased beyond 14 pounds of corn per day. They consumed much more roughness, however, as their record indicates.

The results of one experiment with these steers in which wheat bran, linseed-meal and cottonseed-meal were compared are published

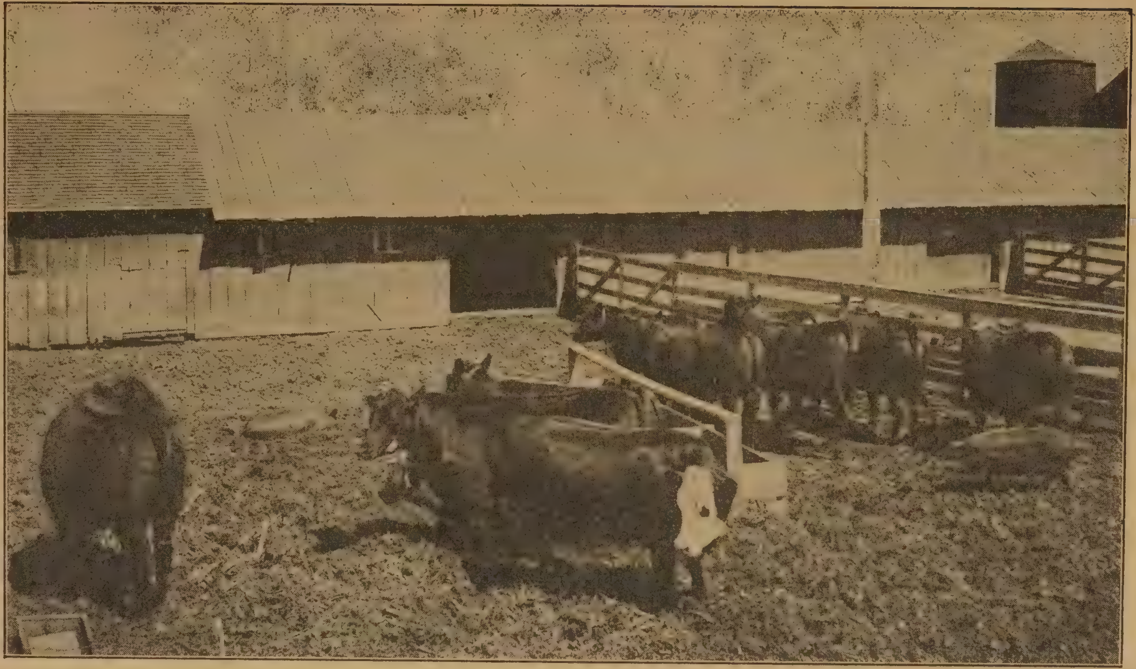

FIG. 7.—Lot 2, on corn, linseed-meal, and corn stover, as they appeared at the close of the experiment, April 3, 1907.

on page 18 of this bulletin for purposes of comparison with the previous winter's test in which the same feeds were used. The records of lots 4 and 5 are published on page 24, in the experiment entitled, "Light versus Heavy Grain Ration," the steers in lot 4 having been fed heavily on grain for a period of five months and those in lot 5 very moderately for six months. The steers in lot 6, the financial statement of which follows, were also fed six months on the same quantity of grain supplied lot 5. During the first two months the steers in lot 6 were fed a large part of their corn on the stalk as corn-fodder to serve as a comparison with lot 5 on snapped corn, while during the last three months they were fed ground corn for a comparison with shelled corn fed that period to the steers of lot 5. The results of the corn fodder versus snapped corn experiment and the shelled corn versus corn-meal experiment will not be published until next year, when the records for a series of three years will be completed. It may be stated at this writing that the records to date indicate that grinding corn for cattle does not pay when there are pigs behind to consume the undigested corn in the droppings. The data obtained in the other experiment during two years show no particular advantage in favor of detaching the ears from stalks supplied fattening steers. However, all conclusions concerning this will be deferred until more data are at hand. In the following financial statement of the sixty steers there is included a small item for cane hay, which was substituted for corn-stover during the closing days of the experiment, after the supply of stover had been exhausted:

FINANCIAL STATEMENT.

Lot 1, on corn, wheat bran, and corn-stover.

1906			
Nov. 14.	To 10 steers, weight 9,737 lbs., at $4.58 per cwt. net, f. o. b. Lincoln	$445 96	
	To 21,140 lbs. shelled corn at 36 cents per bu. ($0.643 per cwt.)	135 93	
	To 8,507 lbs. snapped corn (6,352 lbs. of corn) at 35 cents per bu. ($0.625 per cwt.)	39 70	
	To 7,465 lbs. of bran at $18 per ton	67 19	
	To 11,050 lbs. of corn-stover at $2.50 per ton	13 81	
	To 1,430 lbs. of cane at $3.50 per ton	2 50	
	To interest on $445.96 for 5 mo. at 6 per cent.	11 15	
1907			
April 3	By 10 steers, weight 12,207 lbs., at $5.08 per cwt. net, Lincoln		$620 12
	By 907 lbs. pork at 6¼ cents net		56 71
	By loss on ten steers		39 41
		$716 24	$716 24

(Loss on each steer, $3.94.)

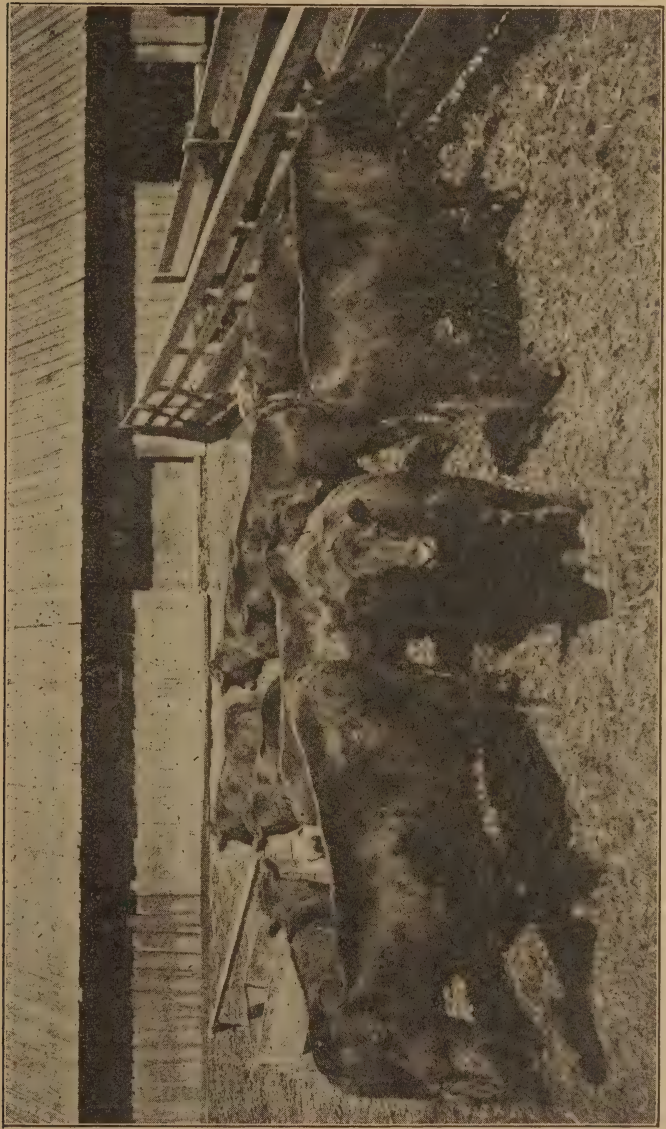

FIG. 8.—Lot 3, on corn, cottonseed-meal, and corn-stover, as they appeared at the close of the experiment, April 3, 1907.

Lot 2, on corn, linseed-meal, and corn-stover.

1906			
Nov. 14.	To 10 steers, weight 9,767 lbs., at $4.58 per cwt. net, f. o. b. Lincoln	$447 33	
	To 22,685 lbs. shelled corn at 36 cents per bu. ($0.643 per cwt.)	145 86	
	To 8,510 lbs. snapped corn (6,352 lbs. of corn) at 35 cents per bu. ($0.625 per cwt.)	39 71	
	To 3,183 lbs. of oil-meal at $29.50 per ton	46 79	
	To 11,050 lbs. of corn-stover at $2.50 per ton	13 81	
	To 1,470 lbs. of cane at $3.50 per ton	2 58	
	To interest on $447.33 for 5 mo. at 6 per cent	11 18	
	To profit on ten steers (pork included)	16 53	
1907			
April 3.	By 10 steers, weight 13,023 lbs., at $5.23 per cwt. net, Lincoln		$681 10
	By 683 lbs. pork at 6¼ cents net		42 69
		$723 79	$723 79

(Profit on each steer, $1.65.)

Lot 3, on corn, cottonseed-meal, and corn-stover.

1906			
Nov. 14.	To 10 steers, weight 9,887 lbs., at $4.58 per cwt. net, f. o. b. Lincoln	$452 83	
	To 22,443 lbs. shelled corn at 36 cents per bu. ($0.643 per cwt.)	144 31	
	To 8,510 lbs. snapped corn (6,352 lbs. of corn) at 35 cents per bu. ($0.625 per cwt.)	39 71	
	To 3,172 lbs. cottonseed-meal at $27.75 per ton	44 01	
	To 11,050 lbs. of stalks at $2.50 per ton	13 81	
	To 1,400 lbs. cane at $3.50 per ton	2 45	
	To interest on $452.83 for 5 mo. at 6 per cent	11 32	
	To profit on ten steers (pork included)	13 16	
1907			
April 3.	By 10 steers, weight 12,843 lbs., at $5.23 per cwt. net, Lincoln		$671 69
	By 798 lbs. pork at 6¼ cents net		49 91
		$721 60	721 60

(Profit on each steer, $1.32.)

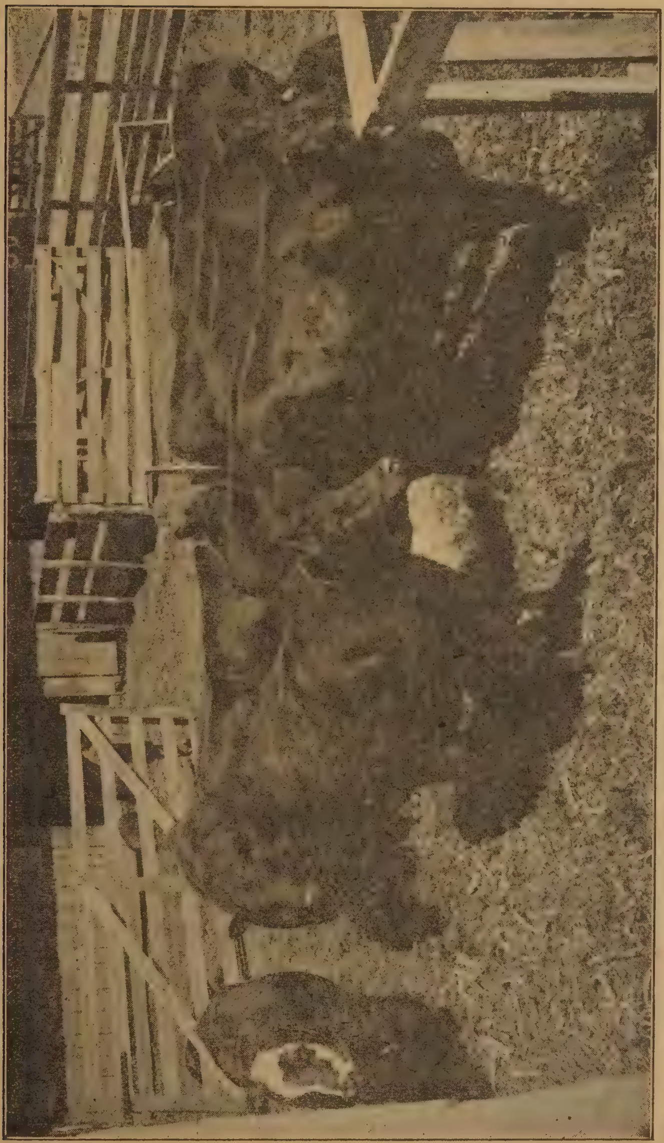

FIG. 9.—Lot 4, on corn, alfalfa, and corn-stover, as they appeared at the close of the experiment, April 3, 1907.

Lot 4, on corn, alfalfa hay, and corn-stover.

1906			
Nov. 14.	To 10 steers, weight 9,787 lbs., at $4.58 per cwt. net f. o. b. Lincoln	$448 25	
	To 25,037 lbs. shelled corn at 36 cents per bu. ($0.643 per cwt.)	160 99	
	To 8,334 lbs. snapped corn (6,221 lbs. of corn) at 35 cents per bu. ($0.625 per cwt.)	38 89	
	To 5,745 lbs. corn-stover at $2.50 per ton	7 18	
	To 7,205 lbs. alfalfa at $8 per ton	28 82	
	To 715 lbs. cane at $3.50 per ton	1 25	
	To interest on $448.25 for 5 mo. at 6 per cent.	11 21	
	To profit on ten steers (pork included)	63 80	
1907			
April 3.	By 10 steers, weight 13,170 lbs., at $5.38 per cwt. net, Lincoln		$708 55
	By 829.4 lbs. pork at 6¼ cents net		51 84
		$760 39	$760 39

(Profit on each steer, $6 38.)

Lot 5, on shelled corn, snapped corn (light feed), alfalfa and corn-stover.

1906			
Nov. 14.	To 10 steers, weight 9,777 lbs., at 4.58 per cwt. net, f. o. b. Lincoln	$447 79	
	To 17,960 lbs. shelled corn at 36 cents per bu. ($0.643 per cwt.)	115 48	
	To 7,210 lbs. snapped corn (5,384 lbs. of corn) at 35 cents per bu. ($0.625 per cwt.)	33 65	
	To 9,392 lbs. of corn-stover at $2.50 per ton	11 74	
	To 18,635 lbs. of alfalfa at $8 per ton	74 54	
	To 2,350 lbs. of cane at $3.50 per ton	4 11	
	To interest on $447.79 for 6 mos. at 6 per cent.	13 43	
	To profit on ten steers (pork included)	38 95	
1907			
May 1	By 10 steers weight 13,157 lbs., at $5.25 per cwt. net, Lincoln		$690 74
	By 783.2 lbs. pork at 6¼ cents net		48 95
		$739 69	$739 69

(*Profit on each steer, $3.90.)

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*The profit per head would have been $4.61 had this lot been sold on a market equally as good as that four weeks previous when the first four lots were sold. The profits on Lot 6 would also have been greater on such a market or the market four weeks later when the quotations were 50 cents per hundred higher for this class of cattle.

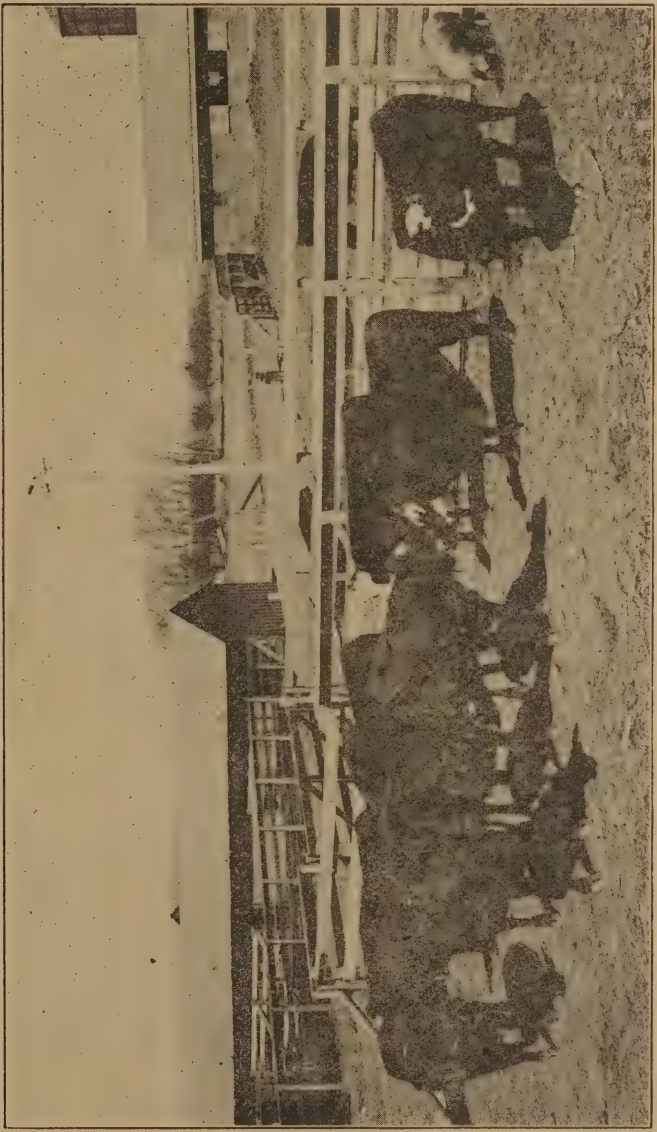

FIG. 10.—Lot 5, on corn (light feed), alfalfa, and stover, as they appeared at the close of the experiment, May 1, 1907.

Lot 6, on shelled corn, corn-meal (light feed), corn fodder, alfalfa, and corn-stover.

1906			
Nov. 14.	To 10 steers, weight 9,813 lbs., at $4.58 per cwt. net, f. o. b. Lincoln	$499 44	
	To 7,250 lbs. shelled corn at 36 cents per bu. ($0.643 per cwt.)	46 63	
	To 7,212 lbs. snapped corn (5,384.4 lbs. of corn) at 35 cents per bu. ($0.625 per cwt.)	29 81	
	To 10,710 lbs. of corn-meal at 70.3 cents per cwt.	75 29	
	To 9,352 lbs. of corn-stover at $2.50 per ton	11 70	
	To 18,620 lbs. of alfalfa at $8 per ton	74 48	
	To 2,350 lbs. of cane at $3.50 per ton	4 11	
	To interest on $449.44 for 6 mo. at 6 per cent.	13 48	
	To profit on ten steers (pork included)	7 05	
1907			
May 1	By 10 steers, weight 13,100 lbs, at $5.25 per cwt. net, Lincoln		$687 75
	By 387.8 lbs. pork at 6¼ cents net		24 24
		$711 99	$711 99

(Profit on each steer, $0.71.)

CONCLUSIONS FROM THESE EXPERIMENTS.

1. Prairie hay when fed with corn alone to fattening cattle gives small and unsatisfactory gains and very little or no profit.

2. Alfalfa hay with corn alone gives large and profitable gains.

3. The use of well-cured corn-stover with alfalfa and corn, while it may not produce larger gains, will make the gains less costly because of its low market value, thereby increasing the profits over corn and alfalfa alone.

4. In feeding only prairie hay as roughness to fattening cattle, much larger and more profitable gains can be made if linseed-meal or possibly some other protein concentrate is fed with corn in small quantity rather than feeding corn alone.

5. The results of two experiments indicate that linseed-meal is a little more valuable than cottonseed-meal and much more valuable than wheat bran for supplementing corn when fed with prairie hay or corn-stover.

6. When alfalfa is made at least half of the roughness with prairie hay or corn-stover, good gains may be made and at less cost than when no alfalfa is fed, the protein being supplied by the use of linseed-meal. In other words, it is possible to grow protein on the farm at a price much below what it will cost on the market in the form of some commercial protein food.

7. Corn-stover cut immediately after the ears ripen and cured in

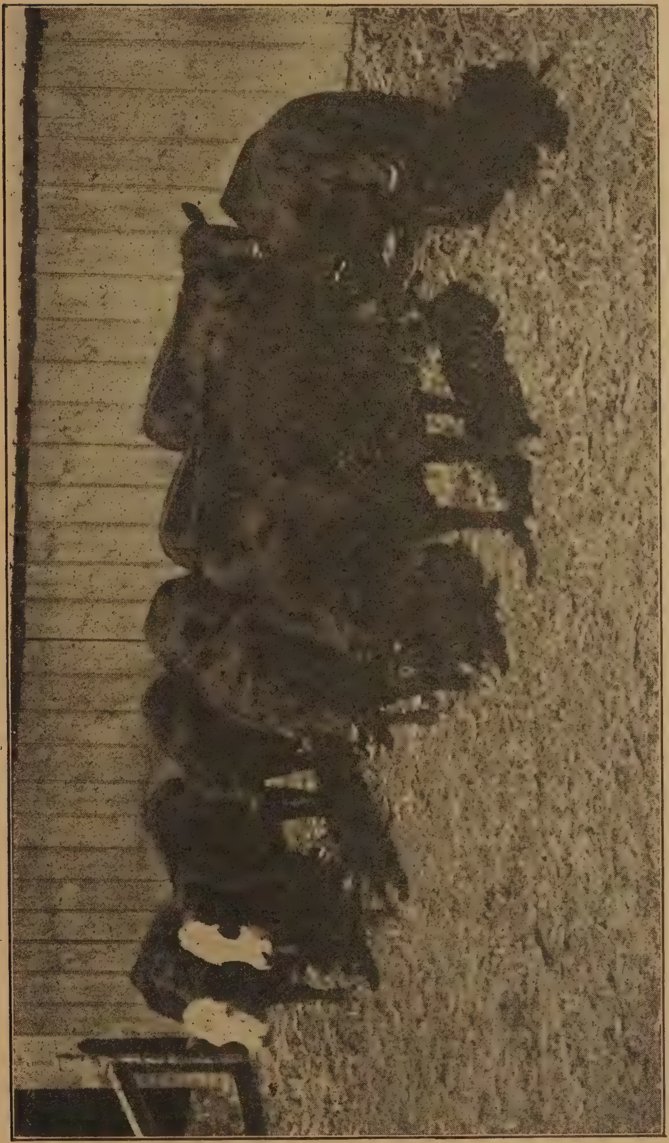

FIG. 11.—Lot 6, on corn (light feed), alfalfa, and corn-fodder, as they appeared at the close of the experiment, May 1, 1907.

shocks possesses a value fully two-thirds as great as prairie hay. The part usually consumed, viz., the leaves and upper portion of stalk, is quite the equal of prairie hay pound for pound.

8. The results of a single experiment in which but little more than half a full feed of corn was supplied two lots of fattening steers suggest the possibility of making a larger use of hay in finishing cattle for market than is ordinarily made and at less cost, especially where hay is relatively low and corn high in price.

9. From a commercial point of view the results of this entire series of experiments go to show that cattle feeding can be made profitable when discretion is used in the selection of foods for the ration. On the average farm in Nebraska where grain and hay command figures below Lincoln prices and where cattle are undisturbed by frequent weighings which experimental feeding necessitates, the profits can be made much greater than those reported in this bulletin. Good feeding will make our corn bring more as beef than when sold direct to the elevator companies even tho the selling price of finished cattle is not far in advance of cost price as was true in many of the these experiments. The importance of manure and the growing of alfalfa and clover as agencies contributing to the maintenance and increase of land fertility argue further for this mode of selling a larger part of our annual corn crop. The cattle industry deserves much greater attention in this state than has been given it in the past.

ACKNOWLEDGMENT.

Acknowledgment is here made to Mr. Joseph F. Lamb, experimental feeder in the department, for his care and precision in weighing and feeding all rations, and to A. F. Magdanz, Jr., and C. W. Rine for valuable assistance in compiling tables.

THE SELECTION AND CARE OF BROOD SOWS.

BY E. W. HUNT.

The primary purpose of this paper is to offer a few helpful suggestions to the average farmer in the state of Nebraska who is raising hogs exclusively for the market. At the outset permit me to lay down some general principles governing the economic production of pork. It should be the aim of every farmer to get the greatest product at the least expense. Here is where most Nebraska farmers will have to introduce a change in their method of doing business. Hitherto they have been occupied principally in getting the great product without paying particular attention to the expense to which they have gone in getting that product. It is not too much to say that the average farmer in Nebraska has no definite adequate notion of the expense to which he has been put in raising his stock. Competition has become so keen, the price of land and of farm products has advanced to such a figure, that in the future it will be necessary for the farmer to keep as close watch of the expense attending production as of the receipts when his product is placed on the market. And it is with a view of helping the farmer to get the greatest product at the least expense that these suggestions are offered.

It costs less to put a good hog on the market than it does to put a scrub of equal weight there. A good hog is one that uses its food to increase its weight, assimilates it perfectly, and lays on flesh rapidly. A scrub is a hog which, for various reasons, does not possess this capacity. Obviously, then, the good hog is a greater money maker than the scrub.

The greatest profit in raising pork comes from forcing pigs to an early market at a weight not to exceed 225 pounds. If one has a hog that weighs 225 pounds and he wishes to add a hundred pounds to its weight, that last hundred pounds will cost him nearly double what any other hundred pounds in the hog has cost him. There is this additional reason for forcing spring pigs to an early market—that, with corn and other food products at the price which they now command in the market, the farmer cannot afford to feed the elements, to feed the weather, and so should strive by all means to get his pigs upon the market before the severe winter weather sets in. For this forcing to an early market plenty of clover or alfalfa pasture is indispensable. If I could not have plenty of such pasture I should go out of the hog business. It was said to me once when I made this statement: "We raised hogs in Nebraska before either alfalfa or clover were heard of, and I guess we can do it again." Yes, but it is one thing to raise hogs on land worth $1.25 an acre and corn worth nine cents a bushel, and an entirely different thing to raise hogs on land worth from $75 to $100 an acre and with corn worth fifty cents a bushel. But with plenty of clover and alfalfa pasture, I believe that it is possible to put hogs on the market at three cents per pound and still derive a profit from the transaction. Of course, in case clover or alfalfa are impossible, the hog raiser must, by some means, procure their equivalent in food stuffs. But I fear that it will not be possible to do this profitably, with food stuffs at their present high market price.

It is a law of Nature that like produces like—not always, but generally; and it is because farmers are beginning to appreciate this fact, and to know the relative certainty with which this law operates, that they are beginning to be careful in the selection of their seed corn, and to select only the best, plumpest, heaviest, best matured corn for seed, though some of us still select our seed corn in the old-fashioned way, at the corn crib with a scoop shovel. It is because farmers are beginning to see that like produces like that they are beginning to be careful in the selection of their seed potatoes, and the wisest of them select only the best, most marketable potatoes for seed, though of course a great many are still planting little potatoes as used to be the general custom. Recognizing that like produces like, the dairy farmer will not keep for a milch cow the heifer calf of a cow that does not pay for her keep. He will select only the heifer calves of such cows as return him great profit, and send the rest of them to market. The wisdom of this course of action, having been demonstrated through a series of years, is beginning to be appreciated by most of the farmers of this state. All that I ask is that every breeder of hogs shall make the selection of his breeding stock so as to take advantage of the operation of this law. What the farmer should do should be to fix steadily in mind that type of hog which he wishes to raise, to keep it clearly in mind, and hold it constantly and steadily there. The man who changes his notion of the desired type every year, will never get anywhere with his breeding. Haxing fixed in mind the type of hog which he wishes to raise, this idea of the type will govern him in the selection of his breeding stock, or at least should so govern him.

For reasons which I will state more fully later on, I believe that every brood sow, while she is caring for her farrow, should have a separate pen. This will enable a farmer to make the proper selection. The average farmer, when he selects his brood sows, waits until the approach of the breeding season and then selects from his general herd the thriftiest, growthiest, most vigorous gilts that he can find. The man who does this knows nothing of the maternal ancestry of the hog so selected. This one particular growthy gilt may be the one sizable pig in a litter of scrubs produced by a scrub sow, and in breeding her the chances are that her offspring will revert to the scrub type from which she sprung.

At the state farm there is a shorthorn cow, celebrated throughout the state, by the name of Florence. She is of a distinct dairy type, and yet comes from a long line of breeding of pure beef type. They have attempted, through her calves, to intensify the dairy characteristics, but her calves invariably revert to the beef type from which the mother came.

Florence is what might be called a freak in breeding, because the law that like produces like occasionally fails, and Florence is an instance of such failure. The big, growthy, vigorous gilt that you select from your herd may be another failure. More than this, in selecting the biggest, growthiest, most vigorous gilts for breeding, the chances are that the man so selecting selects sows from a small litter, because a sow with a small litter of two or three can do so much better by them than can the sow that has a large litter, that her pigs in the fall will show to better advantage, and in breeding them there is danger of perpetuating the breeding of small litter sows. I think the best time to select brood sows is before they are four weeks old. When the pigs approach that age, let the owner get over into the pen with the sow and ask himself, with reference to her, four questions: First, is she of the right shape, is she built in such a way as to produce for me the kind of pigs that I want to raise? The side, the back, the loin, the hams, are the expensive and desirable cuts in pork, and the hog that excels in these particulars is usually the most economical feeder to be found.

I want my brood sow to have a liberal arch to her back, because this arch, sooner or later, will have to sustain the weight of a large litter of pigs, and unless it is strong it will become, first, flat, and later, swayback, indicating a weakness in the back, which I do not want to characterize my herd of hogs. I want her under line to run out straight between the hind legs, and her flank instead of being cut high, to be cut low, so as to give great depth between the loins and the flank, because here is the part of the body where she must develop and nourish a large litter of pigs, and there should be plenty of room for this purpose. When a straight stick is applied to the side of a hog it should touch all along. There should be no place, for instance, behind the shoulders where a person might place his hand between the stick and the body. The reason of this is that the hog should have a large heart and lung girth, because here are the vital organs where the sow must vitalize and purify the blood, not only for herself, but for the young that she is developing, and there should be plenty of room for the exercise of these vital organs. Whenever you see a hog stand with its hind legs thrust forward under it, it is a sure sign of weakness in the pastern joint and in the pastern ligaments, and, as the hog gets older and its weight increases, it will begin to walk more and more upon the heel as the pastern becomes weaker and weaker. I want the hind legs of my brood sows to stand squarely under them, and the sow herself to stand upon the tips of her toes. This is sure proof of strength in the limbs, and a sow must be strong in the legs because she must take plenty of exercise in order to develop a healthy, growthy litter of pigs, and a sow that is weak in the legs will not exercise any more than a man will take long walks for his health when the bottoms of his feet are covered with callouses and corns. For the same reason the fore legs should stand squarely under the hog and the hog should walk on the tips of the toes. It is not necessary to apply a score-card to the hog; these are simply general directions which any man may follow out as best he can.

I want the hog's head to look as though the hog knew something, and as though it had some force, some power in it, and this would imply alert ears, a large open eye, plenty of breadth between the eyes, and a liberal dish to the face.

Now if the sow that he is examining answers to these requirements the best of any hog that he owns, that is one point to be considered.

The second question he should ask, and it is one the answer to which I regard almost as important as the first, is, has she the right disposition? When I get into the pen does she receive me with a friendly grunt, or does she begin to argue and rage, and her hair to stand up along her back, and does she begin to run around the pen in all directions trampling on her pigs and perhaps picking up one in her mouth? Experience has taught me that it usually costs more to put the pigs of one of these hysterical sows upon the market than they are worth. The sow that I select for a brood sow must be of a calm, phlegmatic temperament. She must be careful of her pigs. It has cost me money to bring those pigs into the world, and I cannot afford to have them killed by an ignorant, careless mother. If one of her pigs is in trouble and squealing, instead of lying still and allowing it to die, as some sows do, my brood sow must get up and investigate and find out what is the matter. When she approaches her nest to lie down, she must be very careful to root her pigs out of the way and lie down carefully in such a way as not to hurt any of them. This matter of disposition is just as much a question of selection in breeding as any other characteristic in a hog, and I believe that any breeder, by paying careful attention to it, can rid his herd entirely of these nervous, irritable, unprofitable sows.

The third question to be asked is, does she farrow a large enough litter? I do not believe that it pays to keep a brood sow that farrows only two or three pigs at a litter.

The fourth question, does she feed her litter well? There is a great difference in sows, some of them give an abundance of milk in which there is practically no nourishment, others nourish their pigs adequately. As I am attempting to force her pigs to an early market, the sow must aid me in this, and provide adequate nourishment for her young. The pigs by this time are about four weeks old, and any breeder may judge from the looks of his pigs whether their nourishment is adequate. If their hair lies smooth and they are glossy and fat, if after feeding they lie down and go to sleep and sleep so soundly that you think they are dead, it is sure proof that they are being adequately nourished. But if their hair stands up, is rough in appearance and has no gloss, and the sow when she walks across a field has three or four pigs hanging to her, and the rest squealing for food, and if her litter are tugging away at her from morning to night, it is sure proof that they are not being adequately nourished, and consequently the pigs should be excluded in selecting brood sows.

Now whenever a sow answers all of these four questions affirmatively, if she has the right shape, the right disposition, the right size litter, and feeds them properly, put a mark on the ear of every one of her sow pigs, and they are the brood sows for the next year. In this way go through the entire herd. It takes only a short time—very little time and no trouble, to mark the brood sows for the ensuing season. When breeding time comes all that is necessary is to cut out the sow pigs that have a mark on their ears, for brood sows, and while you may not be able to say of any particular pig that it comes from any particular sow, you can say of every pig that has a mark in its ear, that this pig comes from a sow that had the right shape, had the right disposition, had the right sized litter, and fed them right. By following this method of selection through a series of years, any farmer can breed any kind of a hog he desires to raise.

Just a few words with reference to the selection of the male which is to head the herd. By all means see the hog before buying. Become acquainted with the characteristics of your own brood sows, and then select a male which, when bred to those brood sows, will be likely to produce the kind of hog you want to raise. Too many farmers in the state buy their breeding stock by pedigree, without carefully selecting them. I had rather have a good hog without a pedigree, than to have the pedigree without a good hog. All that a pedigree is worth to me and I believe all that it is worth to anyone, is simply to prove that the points of excellence in the pedigreed animal are the result of a long line of breeding, and are therefore likely to be permanent, and to be reproduced in the get. Any breeder of pure bred hogs is lucky if, out of a dozen pigs, he can get one that can answer closely enough to the score card to make a show animal of him, and this is evidence that something beside pedigree is needed for the man who would be a successful breeder. Study the characteristics of your brood sows and select a boar that will correct their defects in their pigs. If the sows are inclined to be a little flat along the back, select a boar with a liberal arch to his back, and the pigs will show the improvement. If the sows are a little leggy, have too much daylight under them, select a boar that is moderately close to the ground. If the sows are light in the hams, or are coarse, broad, and high in the shoulder, select a boar of the opposite type. Always select a boar with special reference to the type of sows that you have. When you find such an one, and it will pay you well to spend time and money to find him, if he has a good pedigree, so much the better, for then he will probably mark his pigs as you want them marked.

There are several points to be considered with regard to the proper care of the brood sow. In the first place, she should have adequate protection from the weather, adequate shelter. Young pigs need to be kept warm and dry in order to thrive. For these reasons I do not like a board floor in the farrowing pen because draughts of cold air get under the floor and chill and otherwise weaken the pigs. I am also opposed to a cement floor in the farrowing pen, because the moisture and vapor from the hogs condense on this cement floor and keep it moist and cold. The best floor for a farrowing pen that I know anything about is made of dirt, built up six inches above the surrounding ground, over the top of which woven wire netting, with a mesh not larger than two inches, is tightly drawn. A few shovels of dirt are thrown on top of this wire netting to bed it firmly and over this is put the litter for bedding. Here we have a floor which will always be dry, which is wind proof, and which the hogs cannot root up. The walls of the shed should be made practically wind and moisture proof. It is estimated that sixty per cent of the pigs that are farrowed in the state, about straw piles, or in old piles of roughage, or wherever it is possible for the sow to make a farrowing nest, die. This sixty per cent, if saved, would build adequate shelter for all the brood sows in the state. It is bad economy, it is waste, not to provide such shelter.

In the next place, the food of the brood sow requires special attention. You are asking her to develop for you a large litter of thrifty, muscular, bony pigs, and she must have food out of which she can make muscle and bone. If this is not furnished her, so strong is her spirit of maternity that she will rob her own body to get it. You cannot make gold out of paper, and you must not expect a sow to make muscle and bone out of fat, it cannot be done. The farmer who expects to make money in raising hogs, and who adheres to the old notion that corn is the only natural food for a hog, must inevitably fail. In ten pounds of corn there is only one pound of muscle and bone forming food, and nine pounds of fat forming food, and this is not sufficient muscle and bone forming food to enable the sow to do her work profitably and well. Brood sows should be fed all that they will eat of alfalfa hay, with only a limited corn ration, enough to supply them with animal heat and make animal energy. The principal part of their food should be muscle and bone forming food, and alfalfa, in this state, is the cheapest and best food for that purpose. In my experience I find, however, that the hog's stomach being small, she cannot hold sufficient alfalfa hay to provide an adequate protein ration, and accordingly I have found it an advantage to supplement the alfalfa with an added protein ration. Every farmer on studying that requirement must determine for himself which is the most economical food to buy; it may be shorts, it may be oilmeal, or it may be tankage. But if tankage is used, I think the average farmer would get better results by feeding no more than five pounds of tankage to every one hundred pounds of corn fed, in addition to all the alfalfa hay that the brood sow can eat. One gentleman, in this state, whose success entitles his statements to credence, tells me that when alfalfa hay is cut fine and soaked in warm water from one feeding time until the next, it supplies sufficient protein for the needs of the brood sow, and I recommend this method to all breeders of pigs.

When farrowing time comes, each sow should be isolated in her individual quarters two or three days before the actual time for the farrowing comes on her. At this time she is likely to be nervous and excitable, and two or three days will get her accustomed to her new quarters so that she may rest there at ease. When farrowing time comes, my advice to the ordinary farmer is to leave the sow alone. There is such a difference in the length of time required for farrowing by the sows, some are slow and some fast, that I do not think that any farmer should interfere to assist the sow unless such interference is absolutely necessary to save the sow's life, and then it should be gone about very gently and very slowly, because an ignorant, careless operator is liable to inflict lasting injuries on the delicate organs. But if the sow has been properly fed up to the farrowing time, I do not think that anyone need apprehend any trouble with the farrowing. Since I began feeding in this way I have had to pay as little attention to my brood sows in farrowing as to my hens in laying. I let them alone and have had absolutely no trouble whatever.

After the farrowing is completed the handling of the sow should be conducted with a view solely to having the milk, when it comes in full flow, come slowly and easily, without any complications whatever. The sow at that time is weak and nervous and is susceptible to almost any kind of a shock. If she is exposed to the inclemency of the weather, if a cold wind is permitted to strike her, or if after the farrowing you are careless enough to give her a drink of cold water or cold slop, you may give her a shock which will produce a chill and consequent congestion. In the morning you go out to the pen and you find the little fellows all bunched up in one corner shivering and trying to keep warm, and in the other corner you will find the sow lying flat upon her udder, sick. She is in pain, the shock of the cold water or the cold blast of air has produced a congestion of the udder, and the milk has stopped, and the sow is in misery. When the pigs finally come to nurse, they will have to drink this fevered milk, and a pig that has drunk fevered milk never gets over it. He shows it as long as he lives. I advise, as soon as the sow shows that she wants anything, that she be given a drink of warm water, and nothing else for the first twenty-four hours. For the secend twenty-four hours I give her warm water and just a little dry corn. My purpose is to control and retard lactation until the time arrives for the full flow of milk, and the best way to govern this is through the feed, and warm water and dry corn are not lactating foods. The third day she has warm water and dry corn again, and if you have been careful and judicious in your feeding of corn, on the fourth day you will go out and find that operations have begun, the milk has come slowly, steadily, without fever and other complications, and the pigs are at work, and you will feel repaid, amply repaid, for all your trouble and care.

From this time until weaning time the sow should be fed solely for the purpose of milk production. You want her to force her litter of pigs to as rapid healthy growth as possible. It is not your purpose to fatten the sow. Her sole business now is to furnish adequate nourishment to her young, and you begin to feed her solely for milk production, succulent rations, slop, muscle and bone forming foods, with only a modicum of corn. You should gradually increase your food as the pigs are able to stand it, but the sow should not be put upon full feed until the pigs are about four weeks old. This is where the necessity for individual pens for the sows becomes apparent. In one pen you may have a sow that will take all the food that you can give her and still will not overfeed her pigs. In the pen adjoining her, you may have a sow fed on half the ration that will still overfeed her pigs, because she is a very liberal milker. The signs of overfeeding in pigs are two, thumps and scours. You go out in the morning and you find the pigs thumping, some of them. The reason is this: they have taken into their little stomachs more food than they can digest, and the undigested balance lies there and ferments and develops large quantities of gas. The stomach becomes distended with this gas, and presses against the heart, which is closely contiguous, and interferes with the heart action so that the heart has to pump blood over the little body against the pressure of this inflated stomach, and you can see it thump in its efforts properly to perform its work. When I find such a condition of affairs I open the door and let the sow out away from the pigs, and she does not see the pigs again until their little stomachs have become fully emptied. In the meantime she is put upon a ration of water and dry corn to retard milk flow. If the sow while carrying the pigs was fed largely on a fat forming diet, the muscular tissues of the pigs are liable to be loose, flabby, weak, and unable to endure much strain. The heart muscles of such pigs are liable to be infiltrated with fat, or to undergo a fatty degeneration. When such pigs begin to thump, the muscular fibers are liable to give way, producing hypertrophy of the heart. Such a pig is a hopeless case and might better be killed. But when a sow has been properly nourished, little danger is to be apprehended from thumps, if the right action is promptly taken. I have never lost a pig from thumps. Sometimes shotes when first put upon a full corn ration begin to thump. If such are promptly isolated, and all food and most of the water is kept from them, they will usually quickly recover without suffering any serious setback. The same treatment I observe when I see signs of scours. Scours are nearly always caused by some form of indigestion from overfeeding. When the sow is finally admitted back to her farrow her milk flow has been retarded, the little fellows' digestive tract has been cleared, and you are ready once more to begin the forcing process. Then gradually increase the feed of the sow as the pigs can bear it, forcing them continually up to the limit, but being careful not to go beyond it. After the pigs are four weeks old, provide a creep for them where they can receive food on the side, easily digested and nourishing. The best food for this purpose is milk in which has been mixed a little shorts. This will relieve the sow of a part of the drain on her system in the nourishment of the pigs, and will assist in the growth of the pigs.

It is best to wean the pigs when they are two months old, but wean them slowly. By this time they have been, or should have been, running four weeks on alfalfa pasture with their mothers. Some morning when they start for the pasture, let the sows find the gate closed, but with a creep under it to permit the pigs to go out. Outside let the little pigs find a trough full of nourishing, appetizing food, and they will fill themselves up on it and then start, as usual, for the alfalfa pasture. The sows are retained in a dry lot, and their ration suddenly changed to an exclusive dry corn and water diet, which has a tendency to check the flow of milk. After a while you will hear that peculiar grunt which you have so often heard from the sow, and the little pigs will hear it; and they know what it means, and they will come tumbling over one another, squealing for their breakfast—the old sow wants to be milked. They push under the creep, the sow throws herself upon her side, and the little fellows commence business, but they have to give it up in about two minutes. They are already full from the trough and from the alfalfa, and have to suspend operations owing to the lack of capacity. If this plan is followed, in a week or ten days the sow will have dried completely up, and the pigs will have been weaned without either of them knowing that any change has taken place. In the old fashioned way, the pigs, who were used to nursing a half dozen times a day, were taken suddenly away from the sows, very suddenly depriving them of the milk which had been their principal article of diet, producing a digestive shock from which they are slow to recover. The sows, who have been in full flow of milk, are deprived of the means of relieving themselves, and for hours suffer unutterable agony from milk pressure. The breeder is fortunate who does not have serious complications with the udders of sows that are so treated. The more humane, and the more profitable way, is the way that I have above suggested, and I hope that every breeder in the state will try it and satisfy himself as to its economy and its humanity.

After the pigs are weaned they may be fed a limited corn ration with their alfalfa, for a few weeks, and then if corn is short they may be left entirely to the alfalfa pasture. I believe, however, that it is good economy to feed a limited corn ration to the pigs that are running on the alfalfa, but sometimes farmers do not have the corn, and so I say that it is possible to get along without it.

The sows, as soon as the pigs are weaned, may be forced to an early market, or may be put in a pasture by way of preparation for their next farrowing. Many farmers find it more profitable to market their sows as soon as they can be made ready for market, and to depend entirely on their gilts for brood sows for the following season. By so doing they save the expense of feed till the next breeding season, and this is no small item, as aged sows require and consume a liberal ration. It is freely admitted that mature sows generally farrow more pigs and better pigs, other things being equal, than gilts. Whether the improvement in the farrow is sufficient to counterbalance the extra expense of feed, every breeder must determine for himself, Much will depend on the care that the gilts receive. I believe that under average conditions on the average farm in Nebraska, the most money is to be made by forcing the sows to an early market, and in reserving the gilts for brood sows. When this plan is followed, I believe that only mature boars should be used on the gilts, and this will probably require the use of a breeding crate. This method of breeding has a tendency to force early maturity in the pigs, and this is an end sought by all breeders, to accomplish which it may be wise to sacrifice in other particulars. Some breeders object to this method of breeding because they say it will ultimately destroy the stamina, the virility, of the herd. This has not been my experience. But this tendency, if there be such a tendency, may be countered by an occasional cross with a good bacon hog.

Just a word about hog diseases. Some of them, like cholera and the swine plague, are not prevented by any ordinary means, and are incurable. A large part of other swine diseases may be prevented in most cases, and in many cases may be cured. The best advice that I can offer to any swine breeder is to use a judicious system of feeding and use proper methods of sanitation, as safeguards. Keep down the dust. Many hogs die from lung diseases superinduced from breathing too much dust. Keep free from worms in the digestive tract. Many hogs suffer from diseases superinduced by the irritation of intestinal parasites. It is said that an ounce of prevention is usually worth a pound of cure, and a farmer cannot take too much care in balancing his ration properly for his hogs, and in keeping them clean, and surrounding them with the very best sanitary precautions.

Some people seem to have the notion that filth is natural and healthful for a hog, and that they thrive best under unclean conditionss. On the contrary, no animal will show greater or quicker improvement arising from cleanliness than the hog. The hog to do his best needs more and better care and protection than the other farm animals, for nature has not given him the thick, protecting coat of hair that the other animals have. His hair is thin and his skin is sensitive and easily irritated. If one or the other must be neglected, let the stables go, but clean the hog-pen. Change the bedding often and keep it fresh, or the skin of your hogs will be liable to become sore, scurvy, scabby. Under such conditions no hog can thrive. This is especially true of brood sows and their litters. Here is where too many farmers fail in raising pigs.

Observe cleanliness in feeding. Do not feed upon the ground where in dry weather they will inhale dust and other filth in gathering their food, and in wet weather they will have to take it flavored with the leachings of their own excrements. I do not like a feeding floor for the reason that the hogs must pick out their food from among their own excrements, and for the further reason that it is permanent and can not be moved from place to place. I much prefer cheap, durable, home-made troughs so constructed that the hogs cannot get into them, cannot crowd, and which may be easily and quickly cleaned with a hoe.

Keep the digestive tract of the hogs in a healthy, tonic condition. This will require an occasional change, a variety in the ration. Hogs are usually fed so largely on concentrates that acidity and fermentation are superinduced in the digestive tract, and need some corrective. This leads them to root, in the endeavor to find in the earth the mineral elements necessary for their full diet. I keep constantly before my hogs a mixture composed of a bushel of ashes, four quarts of air-slaked lime, four quarts of salt, and one quart of sulphate of iron (copperas). I keep this in a trough to which they have access at all times. It is best to provide a cover for the trough to prevent leaching by the rain or snow. For this purpose I prefer cob ashes, then wood ashes, then coal ashes, and when none of these are to be had I get screenings from the coal-yard. So long as they have plenty of this mixture before them, with proper feed, I have little trouble from rooting. If this acid, fermented condition of the digestive tract is not corrected, it will afford a habitat for the development of intestinal parasites and all kinds of disease germs, and it may lead to an epidemic enteritis, or bowel disease, which is so frequently mistaken for cholera. If the hog is kept in a healthy, tonic, virile condition, he will to a large degree be able to resist the invasion of malignant germs, and this is the only preventive available to the majority of farmers. Abolish the swill-barrel; it is the breeding place for disease. Feed the house slops to the hogs as fast as they are made, three times a day if necessary, while they are still sweet. If you must have a swill-barrel, keep it clean and sweet. Better throw sour stuff away than to feed it.

Get rid of the lice. You cannot economically and profitably feed lice and hogs at the same time. For getting rid of the lice utilize your hog-wallows. If you have none, make one. When it is full of water from a shower, pour crude oil upon it and your hogs will dip themselves. Do this often, after every rain, and if the showers are too far apart, haul water and fill the wallow. Always, however, with this proviso, that you keep the wallow thoroughly disinfected with crude carbolic acid, formaldehyde, or any of the coal-tar dips, so that it may not become a festering pool for the development of disease germs.

Disinfect thoroughly and often your pens. Effectively spray, at least as often as once every fortnight, the walls, partitions, and nests with crude carbolic acid or any of the coal-tar dips. Help the hogs to fight disease. Keep their pens clean and healthful.

The hog is the mortgage-lifter. He makes agricultural prosperity. Give him a fair chance to show what he can do. It is said that corn is king in Nebraska. But a revolution is getting under way. I believe the time is not far distant when corn will be dethroned, and the hog and the dairy cow will become the joint sovereigns of this magnificent realm.

THE NEW TYPE OR GENERAL UTILITY HOG.

BY H. C. DAWSON & SONS.

There seems to be, at the present time, considerable discussion regarding this type, and seemingly some variance in opinions as to what constitutes it. Those who have had practical experience with the big mellow fellows need not be prompted, but the breeders of the east who have for years ridden in the rut of the smaller fancy kind, would learn what it is, and how it came to be. Its originating is but the outcome of evolution of type that has been in progress in Nebraska and Kansas for several years. These states peculiarly have demanded a different type of hog than there was in existence to grow and fatten upon their diversified food-stuffs. Events in agricultural livestock and history transpire rapidly in the west. It is not the habit of westerners to travel beaten paths. They are men of great and almost unlimited undertakings, ofttimes one man operating areas practically equal to that of a county in eastern states, as one farm, producing wheat, corn, cattle, horses and hogs, and profit is the important issue, and if a certain thing doesn't pay they won't raise it; they soon grow to know the best seed wheat, the most productive corn, and the most profitable type of horses, cattle and hogs. It is their business to do so; success attends if they practice it and failure if they don't, so this question of type has become practically the most important of all. The great west is full of hogs, and has been for years—good ones, too, market toppers, anywhere. But we are progressive, we wanted better and adapted to our uses and environments. It was not for one man to say what the future type of hog should be, nor for a few men to make or create it, but many men and many minds, with the pressure of nature, of food-stuffs and of markets behind them, worked away at the evolution of type. Farmers demanded of the breeders something different, something more profitable, something fitted especially to grow and fatten on western farms. How well they have succeeded is well known. Nebraska and Kansas stand close to the top in numbers of hogs, and produce more hogs for market in proportion to numbers of brood sows than any other states. They furnish the market toppers and the meats for the best brands ever invented by packers for bacons, hams, etc.; and, incidentally, the hog raisers of the great west have made more and quicker money than anbody else on the globe, in the same business. The west was once known as the great American desert, but now as a garden of diversified food-stuffs; seemingly, everything grows that's edible for man or beast, and with scientific handling all live stock that is grown and fattened on these foods are the acme of production, nothing more tender, juicy or palatable—the marbled beef and the choicest muttons—the sweetest hams and the finest of bacons, with corn in abundance, and of the best quality, wheat everywhere, oats, rye and barley in sufficiency, alfalfa to eat, to root, to lie on and to sleep in—summer time, winter time, always, everywhere and in profusion. With the best of all these and an almost ideal climate for his hog-ship to live in, how could the western hog be different than he is? He wouldn't and couldn't have been different, for the west has to have the best there is, and others need not apply. We will make him better if we and, and we surely will.

With a lifetime of experience we believe the future will be of more uniformity, and a much better and more rapid producer of better meats and dollars of value than the best of ours today. All along through our lifetime we have noted the many happenings that have transpired in the hog making history—some things to the good, and some things to the bad; but in the end, mostly to the advancement of the breeds. We have found that no one man or set of men can establish or fasten a certain type or breed upon any section, the laws of fitness and profitableness eventually win and it seems that today we are but standing upon the edge of a new era in this hog business. The hog men of the near future will look back and wonder how we "old fossils" made money with the hogs we had, and the way we fed and marketed them. So out here in the land where farming pays the highest per cent on the investment, with land values going up almost to the blue sky, and labor scarce and high, we are and have been compelled by our experience of the past and the needs of the present and future to produce the most profitable type, and the many years of experimenting and breeding have filled our breeding pens with it, and we are not only filling the demands of our close neighbors, but even unto the "effete east." It was not a single night's pipe dream and the awakening proclamation of the morning of the finding of a many thousand dollar king or queen or of a Moses in the bull-rushes. Our business has been more of a manual nature and not from the "picturesque" or "literary" standpoint, and our appreciation goes further for a good individual right before our eyes, than for the mechanical illusions so profusely set to song and verse by tongue and ink, by those who are working the "hot air" methods overtime.

We are supposed to be in the hog business for the money first; the secondary reasons are: Pleasure, adaptability, necessity, pride and manifold others. It would seem from appearances that some wish to utilize it for self advertising purposes. Sometimes the self-conceit and pride of seeing their own names and faces appearing often in public print and places has more allurement to some people than does the business they are engaged in, and in this day everybody seems to be looking for the short way or cut to make money and the hog business has this affliction. The farmer, being the most conservative class, buying his breeding stock at but fair prices, he breeds, raises and fattens the offspring and sells them for pork prices, and generally receives a fair percentage of profit and slowly, but surely, pieces together a tidy little fortune. The majority of breeders buy rather spasmodically, some low, some high; get soaked and soak some in return, and have a whole dictionary of experience; sell best they can and about as near right as they know how, and in the end have collectively advanced the betterment of the breed. They have probably learned after their many years of experience that they thought they knew more at the beginning than at present, but they can't quit the business if they would try; there is some sort of a fascination they can't resist and in spite of the fact the business has only paid just fairly well, and only a slow, but a very steady increase in personal worth. You will find these men's names on the record books so long as they can write a pedigree. Here is the back-bone of the hog breeding business. Take him out and you will have only a "bursted bubble" left. Then comes the class of "enlightened breeders," the hurry up, get rich in the "high finance" way. They do not seem content to get money slow or to build up the reputations of their herd or selves in common with other breeders, but put in working all plausible schemes to enhance and boost the values of the certain individual hogs owned by them, and enter into all sorts of combinations to bring about sales and to secure results on sales that place a price on their stuff, mostly ninety per cent fictitious and ten per cent real, and, if they are successful, good talkers and advertising managers, they generally succeed in getting enough cash out of the chain of deals and transactions to repay them for the efforts expended. This class of breeders in the main are in the end, more detrimental to a breed than the cheap breeder who sells $10.00 hogs or the farmers who swap pigs annually. They, figuratively speaking, are as flies, attracted by the smell of food-stuffs on the dinner table: "Here is something sweet, something nice, these men are eating. Let us get into it and have some, too," and to the "old line" breeders they are just as welcome.

Now, if we want to raise hogs for mere fancy and pleasure alone, and there was a greater demand for "parlor stand ornaments," and "pretty pictures," and sweet names, and if the business got so fashionable that society demanded it, of course we would have to adopt the score card, as recently revised by the Illinois State Swine Breeders, which raised the points of ears, eyes, neck, jowl, coat and cut down the points of hams, sides, backs, loins, ribs, etc. Now, it seems it's the looks of the hog that goes with them, not how he is built. So society back east must surely delight in pickled snouts, toasted ears, canned eyes, and mince meat, and have placed a ban on hams, bacon, tenderloins, etc. Now, rest assured, had we the demands for a type of a hog that produces such meats, we western fellows would have it abundantly in the highest state of perfection. But we have a demand directly to the contrary, and it's for the general utility kind—the hog of general usefulness and a cutter of lots of high priced meats. A hog, first, of large size, mellow and roomy in architecture, of good, big, even, round bone, with a medium fine head and ears, carrying a medium jowl, and of good length, with an arched back, and an even and extended rib line, deep sided, and an even width of shoulder, side and ham, fairly deep hammed and of strong individuality. possessing the peculiar characteristics of growing in size as well as fattening, and being adaptable to grow to any size and then fatten into a cutter of high-priced meats, rapidly, at any time. Whether he is five months or two years, he can be marketed at top prices and as we must soon know, the packer will soon be buying hogs by the percentage of his dress in meats, the hogs that cut the most will be market-toppers. Let it be no wonder the west "is here with the goods to get the coin." Personally speaking, the hog can not be too large for us, if they have the essential feature of the general utility type. We know there are extremes in size, both ways, and the big ones, without scale or quality, are as bad sometimes as the small, "pocket editions."

Now, did you ever, fellow breeder, receive an order for the smallest, prettiest, sweetest little-boned pig you ever raised? No! It's generally for size, bone, gravity, etc. It's generally known, it's impossible to get bushels into peck measures, and you cannot substitute an image for the real thing. And again, to change the type of a herd it takes time. 'Tis not "Presto, change!" as many of our breeders would fain have us to believe. No, Mr. Eastern Breeder, just the changing of printers' type won't change the hogs in a day. You will have to breed it, get some blood and stay by it. We have heard that on account that most of the states used small type judges, that Nebraska should get in line, on account of "prevalence of type." But from later returns we find many 1907 small-type judges had some "bitter pills," and the echoes are still ringing into the effete east, and ere the year 1908 closes, who can tell what history shall have been written? There is one thing sure, it's for the survival of the fittest, and that the farmer, the pork producer, the consumer and the packer seem to be behind the general utility hog movement, and it's mostly the ones who would "help save our ship," that favor the "boom-fancy, little type."

We Poland-China men are not alone in this type question and we are also criticised by others. Hear what Mr. N. H. Gentry, who is probably the greatest breeder of the Berkshires in the world says in regard to the Poland-Chinas. "Why some of the Poland-China breeders are led away by the 'fads and fancies' is hard to understand. I refer to the pretty, little dimpling type, some of them having a middle not longer than one's hand, after the ham and shoulder are cut off. In fact, I am a firm believer in the long, even hog; and again I repeat, I believe that the middle of a hog from top to bottom is the most valuable part of the hog. I believe enough breeders and judges have yielded to this 'fad' idea as to lower the average quality of the breed." Now, gentlemen, how does it sound to you? If Gentry is wrong, God pity the rest of us.

There is also too much stress placed on pedigree and not individuality.

Let me say plainly, pedigree is secondary to individuality, and when it goes to extremes for pedigree it spells "ruination" to the breed. The best of sires and dams produce back numbers, and even if they are sired by Tom Corwin, Chief Tecumseh II, Chief Perfection II, or any great sire, does not insure excellence or that they are worth hundreds or thousands of dollars. Lots of these are only fit for the market. As to the many thousand dollared hogs some have been worth it, and there is some to come that will be, but there is only a handful of hogs that are worth it in a man's life time, and it would take a committee some time to fill out a list of a dozen in number, starting from the first recorded, that could safely belong to the $5,000 class, while to read a few papers and catalogues it would seem that we had suddenly arrived at the "Zenith of perfection," and that it is impossible to produce a hog any more (if he has not a pedigree) worth less than a thousand or so. This is too happy to be true, and when you awaken from your dream you will find that the men who operate the business on these plans are generally wise enough to gather "hay while the sun shines," and are safely in the dry when the down-pour comes. If they don't they know the "boomerang" will get them, and how well they fear it. It is very noticeable now by the calls to "stand by the guns; pay at least one-fourth cash, hold this thing up, boys till I can cash in. Now I bought of you fellows, please come buy of me, etc." The breakers are just ahead. There seems to be two ways of watering hog stock—one for the hog's wants; the other for the wants of the owner; either way will work all right, if it is 100 per cent pure, for a hog won't burst on good water, and the hog business won't burst on a cash basis. So, generally speaking, the western hog men do not view the future with fear and trembling, as have several of our "fancier breeders," many of whom have been seemingly created over night and lauded by pages of pictures and masterpieces of literary efforts as peers and pastmasters in their line. There seems to be one thing that we Nebraska hogmen have not mastered, is the "high financiering." We have plodded in the same old way—buying and selling for cash; so when the call is made for the dollar we know it doesn't mean us, and when it is begged that the purchasers should at least pay twenty-five per cent in cash, surely we don't want it that way out here. Please, Mr. Fancy Hogman, let us western fellows keep up old customs of paying around 100 per cent cash or its equivalent, we know sure we don't get $5,000, $6,000, $7,000 or $8,000 for single hogs that way, but what we do get goes "quite a way" and keeps us well content. In this day and age there seemingly are lots of games and grafts, and sometimes men get the game and graft and sometimes it gets him, and as we note the recent panic on Wall street, we should judge the latter happened, all because some fellow wanted to see the color of the real money for once, in their many-million-dollared, water-stocked, catch-the-sucker transactions. We have heard it said that if all the notes were forced for collection in the hog business it would cause considerable flurry in the hog breeding business.

> "So 'eres to the general utility 'og,
> Be he of blacks, whites, or reds;
> For of him 'tis often said,
> 'E rooted the mortgage off 'un our 'eads.
> The best w'at is, and 'ard to beat,
> 'Es chuck full of dollars, and 'blooming' good meat."

DISINFECTANTS AND THEIR USES.

BY FRED W. ARMOUR.

While the title of my subject is broad enough to permit of a great deal of theorizing and scientific deduction, you need not fear that a long and learned lecture is about to be inflicted upon you. I shall, on the contrary, confine my remarks to a plain and concise statement of facts regarding the necessity of good health and individual comfort of our domestic animals, if they are to return a fair profit for the feed and care bestowed upon them, and how efficiently a reliable disinfectant can aid in securing these conditions.

Let me say, in the beginning, that the evolution in the live stock industry which is constantly going on, changing the scattered herds and flocks raging over a wide area, once a feature of this western country, into the systematic and concentrated methods which must always be a feature of intensive agriculture, have made the spread of infectious and contagious diseases not only more common, but more disastrous to the owner of live stock. It is a condition which is not only natural to all animals and fowls, but also to mankind. The farmer with his nearest neighbor half a mile away, is not subjected to the dangers from infectious and contagious diseases that are a constant menace to the millions of people cooped up in the tenement houses of New York, Chicago, and other overgrown cities of the old and new world.

Disease germs, vermin and parasitic insects increase in numbers according to the supply of food offered for their development. The fruit and grain grower, as well as the farmer who raises live stock, have found that this law of nature seriously affects their business, if means are not taken to counteract its influence. The necessities of civilized man, and especially his requirements for food and clothing, have gradually developed systems of prevention and remedial agents to eliminate as far as possible the ravages and heavy losses caused by such diseases and insect pests, which would otherwise threaten the world with famine.

Nature itself lends its aid in preventing the spread of disease; but, as usual, it is coupled with the demand that each individual shall exert himself to make the most of her offered assistance. There are no more potent influences in the maintenance of sound, vigorous health in our flocks and herds than pure air, sunshine and pure water. They are the great health preservers that are common to every land, and so cheap that they are not valued as they should be. Hence we find herds of dairy cows housed in damp, dirty stables, in which neither light nor sunshine can find their way, and the supply of fresh air is not one half what it should be. Such stables are the breeding places of disease germs and insect pests, and when a contagious or infectious disease breaks out as a result of these conditions, the careful owner is liable to suffer from the unwise and lazy methods of his neighbor. The germ of hog cholera will attack the herd which has been properly cared for as well as the one that has been neglected, but the latter is always the starting point of the disease, and therefore a constant danger to every herd in the neighborhood.

Now, here is where an effective disinfectant becomes invaluable. It is a destroyer of disease germs in the soil, in the stables and pens, as well as on the bodies of the animals attacked, before they have had time to do much damage. In conjunction with proper conditions for maintaining the health and vigor of live stock, a proper and timely use of a disinfectant, which will also destroy vermin of all kinds, is the only means which affords the owner of live stock immunity from severe losses. The owner of a flock or herd should never forget that eternal vigilance is the price he must pay for escaping such losses. Prevention is always cheaper and safer than remedial measures, as no matter how effective such remedies may prove there must be some loss before the disease can be banished from the farm. In other words, it is better to stand the cost of disinfection than to meet the loss of several animals, and to pay the cost of disinfection and remedies as well.

As there are a great number of disinfectants, and "near-disinfectants," on the market, it is well to consider what are the most essential characteristics of a true disinfectant.

First is its effectiveness in the destruction of disease germs and the purification of the air in unsanitary pens and buildings. While doing this work effectively it should also destroy all vermin infesting the animals and premises to which it is applied.

Second, its effectiveness should not come through its poisonous qualities, for that would mean constant danger to all living things on the farm.

Third, it should neither be inflammable nor explosive, for that would add greatly to the danger from fire in farm buildings.

Fourth, its cost should be light, and the methods of mixing and application as simple as possible to prevent mistakes.

Judged by these essentials there is no doubt but that the coal-tar disinfectants, in their standardized form, are the safest and most reliable. Take Zenoleum, for instance, the oldest and best known of the coal-tar disinfectants, and it can not only be used as a disinfectant, but also to destroy vermin of all kinds, whether in the form of the mites that cause mange on hogs and cattle, scab on sheep, and such pests as lice and ticks on cattle, sheep, hogs and poultry, but it can be used as a remedy for internal parasites with absolute safety in the strength advised. It is permitted to be used in the official dipping of sheep affected with scab by the United States Department of Agriculture, as a standard preparation. For this particular purpose coal-tar preparations have a value over all other dips from the fact that they neither discolor the fleece, nor weaken its fibre. On the contrary, they add to its lustre and promote its growth. Of course there are a number of coal-tar dips on the market, and all of them do not possess all of the essentials I have described. I can only advise careful tests, and to remember that a cheap article may in the end prove a most costly disappointment.

And now a few words on what I consider would be useful appliances on every farm on which live stock is kept, and I will close. There should be airy and comfortable quarters for all kinds of live stock suited to their requirements. Next should come a yard with a building in which animals showing symptoms of disease should be quarantined. It is a necessity, and will become more so in the future with the steady spread of such diseases.

Where permanent pastures of alfalfa are the rule, by having separate fields and changing the class of stock grazing on each field every season, the danger of the soil becoming infested with disease germs is greatly lessened. Germs that produce disease in one class of stock seldom attack another, and they die out for want of the proper conditions to enable them to increase and multiply. The germs of hog cholera do not attack cattle, sheep or horses, neither do sheep or cattle ticks attack hogs or horses. A system of stock rotation in pastures will be found a very effective measure against the spread of infectious and contagious diseases, and it can be carried on with but little expense to the stock owner.

Then the farmer or breeder with a large herd of swine should avoid the danger of having them seek filthy wallows in the hot summer days to cool themselves. These wallows sooner or later become infested with the germs of various diseases, and every hog that uses them is exposed to their attacks. Fill them up and in their place build a wallow of planks, large enough to accommodate half a dozen hogs at a time, fill it with clean water to a depth of twelve or fourteen inches, add a quart or two of Zenoleum. About once a week, or oftener if necessary, renew the water and the disinfectant. The hogs will then do their own dipping, and the germs and mites, with the ever present lice, will be driven out and destroyed with little trouble or cost. The hog, from its nature, must have an opportunity to cool its body during hot weather, and owners should take advantage of this characteristic to have them do their own disinfecting. Since Prof. Shepherd, of the South Dakota Agricultural College, proclaimed the efficacy of "piggie's bath-tub," it has been tested by many farmers with excellent results.

A hand sprayer is an essential part of the outfit of every farm where live stock is kept, as its use in spraying buildings, yards, etc., with a disinfectant makes it a valuable assistant in keeping the premises free from disease germs, foul smells and vermin.

Lastly, if you have a large number of live stock to care for, it will pay you to build a dipping tank, and dip your animals twice a year, especially late in the fall, so they will go into winter quarters free from vermin and pests of all kinds. It will add to their thrift, and you will get the better returns for your feed and labor. If you learn that hog cholera is in the neighborhood, run your hogs through the dipping tank as a precautionary measure. It will pay you.

That finishes my talk on disinfectants and their uses, and I hope it will prove helpful to those who have never tested their value. They are indispensable on the stock farm under modern conditions.

POULTRY.

BY D. P. ASHBURN, GIBBON, NEB.

Perhaps there is no industry that is so badly underestimated, both in its volume and in its importance as the poultry industry. Statistics show that there were $11,250,000 worth of poultry products produced in the state of Nebraska in the year 1906.

And as to its importance to the human family, it is only necessary to state that almost every man, woman and child in the United States is directly interested in and dependent upon either poultry or its product (eggs) as producers or consumers. Almost every human being consumes poultry or eggs, or foods that contain eggs. The child at the mother's breast is nourished from the food of the mother, of which eggs or poultry usually forms an important part. It has but one rival, if any, as a food, and that is milk. The greater part of the poultry and eggs consumed in the United States is produced upon the farms, and this in spite of the dislike of the average farmer for the poultry that his good wife insists on keeping. She realizes their value and the very important part poultry plays as a means of supplying the material for the food she has to prepare daily. He gives the hen but little thought except when she roosts upon the plow handle or other farm machinery or gets into the horse-trough, because he has provided neither shelter or food for her and she is compelled to "rustle." Then he makes war upon her and has a standing quarrel with her, and the patient wife has a hard time to keep up the number and quality of the flock. He eats the good food his wife prepares without thought or appreciation and will carry a basket of eggs to town and trade them for family supplies, if there is anything coming after he gets what tobacco he wants.

We are glad to notice, however, that there is a rapidly growing interest in poultry even by the farmers. The efforts of the wife are being assisted by the farmer; poultry houses and yards and feed are being provided and the result is a great increase in both quantity and quality.

Poultry is really one of the best resources of the farm. The healthfulness and purity of the food it affords the family cannot be excelled. But it is not my purpose in this short article to dwell upon the great volume or importance of poultry, but rather to speak of some practical features that are often overlooked in the care and management of the flock.

Perhaps there is no business common to the farm that requires a knowledge of and attention to so many little details as does poultry. We are working with nature, and our work in the poultry yard will interfere with and defeat the efforts of nature or supply the means necessary and assist nature just in proportion to our ignorance or knowledge of nature's laws. Ignorance and neglect means failure or at best, poor results, while knowledge and careful attention insure success. It is not so much the increase of effort as it is the intelligent properly directed effort that is needed. There are very many items of the necessary knowledge we must possess, before we are certain of good results, and ignorance of or a failure to comply with nature's demands in any one of these items may defeat the best efforts of the otherwise well educated poultry raiser. To illustrate: Proper temperature for the little chick is a very essential feature from the time incubation begins until the chick is three or four months old. A little chick that has once been thoroughly chilled before it is four weeks old is worthless. It may live along and make a feeble effort towards development, but will never repay its cost of keep. Thus one may know what eggs to select for setting, and just how to incubate them, and know just how and when to feed; but one night's neglect or failure to keep the brooder at the proper temperature will defeat all the preceding good efforts and care. It is a business that requires both knowledge and thoughtfulness, and for that reason it is one of the best features of farm life especially for the boys and girls, whose active young minds need occupation and education in pure channels in contact with nature and nature's laws, and in acquiring habits of thrift and care.

The first thing to be determined, is how shall we get the little chick—shall it be by natural or artificial incubation? Artificial incubation is becoming very common and is usually successful in the hands of any one who will follow the directions of the manufacturer and has in their mental make-up a little turn for watchfulness and vigilance—and one who is liable to forget or neglect the essential details had best leave this branch of the business to the old hen, who is endowed with "eternal vigilance," and knows just when and how. But whether we use the hen or the incubator it is a good plan to set several hens at one time and candle out the eggs under them and rob enough of them to replace the bad eggs that are found under the rest, and start those we rob anew. Or, if we are using the incubator rob the hens to replace the bad eggs, so we may have a full hatch in the incubator.

If one cannot provide a good brooder room so temperatures can be controlled in bad weather, and a sufficient number of hens can be set at the same time the incubator is filled, it will be found quite practical to give all the chicks to the hens. Any of the American breeds can care for thirty chicks (other breeds according to size) if in good quarters, thus relieving one of the care of the flock in the brooder.

If we assume the care of the young chick when hatched, we should know what the old hen knows and apply the knowledge. The first ten days will pretty nearly determine what per cent of the hatch will reach maturity. The writer has lost 90 per cent as a beginner, and has matured 95 per cent after years of experience and study.

The greatest mortality results from improper feeding. The first thing to be given is grit—clean sand is good enough. Never give foot first. The chick has no means of digesting it, and bowel trouble will result. No food should be given under 48 hours and 48 longer will not be detrimental The last act of nature in incubation is to inclose the yolk of the egg within the abdomen of the little chick to be absorbed as food for its maintenance and development for the first week or 10 days. If food is given in sufficient quantity to supply the chick before the yolk is consumed the digestive energy will be bestowed on the food given and the yolk will be neglected and it will spoil and cause bowel trouble that is incurable. The writer provides a small yard in front of the brooder in which is placed some kind of light litter; clean chaff, or sawdust is good, and sprinkle just enough of dry fine food (millet seed or the cornbread left from breakfast, well dried in the oven and crumbed up fine, or something of like nature) in the litter to induce scratching, but not enough to form any part of a ration. The exercise of scratching helps to develop strength and growth. Watch the flock carefully, especially the note or call when you approach them—the call will be quite different when the yolk is all consumed and the chick becomes really hungry—then increase the feed, but do not overfeed. Better not quite supply their wants at first than to have part of the food left. After ten days or two weeks feed all they will eat up clean. From start to finish provide pure, clean, cold water, so that it is always accessible. Sweet milk may be given to chickens of any age and sour or clabbered milk is good food for matured fowls, but milk that is on the eve of souring is dangerous, because it ferments in the crop and forms gas that is very injurious and often fatal.

The food is a very important item at all ages and should be carefully selected and regularly supplied, if we keep the flock in yards and houses.

The greatest profit in poultry is upon the farm where they run at large, acting as scavengers and securing bugs and other insects and usually find a balanced ration unless they are allowed to run to a corn or other grain pile and gorge themselves, when they soon become fat and lazy and are worthless except for the market. A hen that once becomes very fat will seldom ever be a profitable layer after—no matter how she is fed.

With yarded chickens the writer has found the following ration very very satisfactory and equally good for those that run at large, when it is found necessary to supply part of the ration:

10 pounds wheat bran.
10 pounds shorts or middlings.
10 pounds corn-meal, ground fine.
10 pounds oil-cake, ground fine.

Mix thoroly and for chicks two weeks old, and over, wet with sweet milk, making it just wet enough to crumble off the spoon, not so it will pour. (Never feed chickens of any age sloppy food.) For old hens or matured fowls add 10 pounds of dried meat scraps from the packing houses. Ground bone the size of pin heads should be always accessible to young chicks. Green alfalfa in summer and dry alfalfa hay, last cutting, in winter, has no equal as a supplement to the grain ration. This grain ration may be fed as a wet mash to all fowls, old or young, and it is equally good fed dry in troughs or self feeders, where the flock can run to it at pleasure, and so protected that they cannot waste it. The writer has used this dry mash kept before the fowls and a light shelled corn ration just before roosting time, with a sprinkling of wheat, oats, barley, speltz or any kind of grain thrown in the litter on the floor of the scratching room to induce scratching and keep up the exercise which is very essential for the laying hen.

Always supply plenty of pure water; 62 per cent of the egg and 50 per cent of the hen's body is water. How can she be healthy and productive if the water is not supplied?

We have two great drawbacks to contend with in poultry raising—lice and mites. The former are easily subdued, but the latter require a constant battle in the warm months.

For lice, dip the hen in a solution of tepid water, 99 parts to 1 part of kreso or zenoleum, or chloro-naphtholeum, or creosol, or any other dip made from coal-tar, which can be secured at any drug store. Provide enough of this dip to completely cover the fowl. Hold by both wings firmly held together over the hen's back in the right hand and by the head in left hand, submerge all but the mouth and nose, and completely saturate every feather and soak the skin thoroly. Let them dry in a clean yard or house in the fore part of a warm day, so they will be dry by roosting time. Be exact in mixing the dip, making a one per cent solution. After dipping the flock, add enough of the drug to make a 5 per cent solution and spray all parts of the roost and hen-house and you will not soon be bothered again with lice. Be careful to wet the top of the head while dipping, otherwise the worst of all lice, the head lice, will escape. If other poultry is added to the flock it should be dipped before it mingles with the flock or enters the premises. It is very different with mites, they leave the hen in the early morning and remain in the roost or house, hid away out of reach of any spray that may be applied for their immediate destruction. Fumigation will not reach them. After many experiments the Iowa Experiment Station has given us the most practical method yet discovered, viz., thoroly spray every part of the roof or ceiling, walls, floor and perches, with kerosene emulsion, which leaves a sticky coating which holds Mr. Mite in its fatal grasp whenever he tries to crawl forth for his nightly feast. This coating will gradually dry and harden so the insect can crawl over it with ease and safety. Then it will be necessary to repeat the spraying. It is a battle royal and must be kept up during the warm months and begun in early spring.

I will not take up any more of the very many practical features that insure success. This article is already too long, and I will close by saying that in the writer's judgment the great need of the poultry industry of Nebraska is a live state organization that will devote its energy to the promotion and development of the utility side of the business; to the increase of laying qualities and cheap profitable production of meat, leaving the fine feathers and fads to the poultry fanciers. A free, unoccupied field awaits such an organization.

BEE-KEEPING AS A SECONDARY OCCUPATION ON THE FARM.

BY J. E. ATKINSON.

After enumerating those who are born great, and those who achieve greatness, Shakespeare says: "Others have greatness thrust upon them." A few days ago when I received a letter from your secretary, saying, "No doubt you have already received a program of the state meetings, and learned that you are to give the bee-keepers a talk," I felt the symptoms of exhilaration, importance, conceit and puffed-up-ness, usually shown by those "others," who have greatness thrust upon them. While fully appreciating the honor, I knew that a mistake had been made, and that I could not meet the implied obligation with any degree of satisfaction to you, or to myself. However, it seemed that you must need help very badly if you could risk getting it from an outsider, and that the outsider would be very unappreciative and selfish, not to try. Then I reflected that your misfortune was my opportunity, and that if you could stand it, I could. First, a little personal experience. There were no wild bees in Nebraska when the first settlers arrived. At present the woods are full of them, in the southeastern part of the state, at least. As near as I can learn the first bees were brought to our part of the state from Iowa in the early sixties. They were hauled on an ox wagon, in a section of hollow log. The log, or hive, was suspended in the wagon box in a sling of ropes, to minimize the severity of the jars and jolts incident to this mode of travel.

In the fall of '71 our family drove back to Wisconsin to visit relatives. The day our visit ended an uncle "robbed a hive" as he called it, first killing the bees with brimstone. Then I tasted honey for the first time, just a little taste, too. We were given a gallon pail two-thirds full of broken comb, containing honey, bee bread, and some bees, and this we brought back with us. It was an extraordinary treat doled out in small "tastes" on rare occasions, and lasted a year or two. But we had tasted honey, and the longing for more persisted, and grew.

In the early spring of '80 or '81, a family moved to our neighborhood from Illinois, bringing some twenty stands of bees in large, clumsy, old-fashioned hives, having frames mortised and nailed in, and supers containing three or four oblong boxes with glass sides, for the surplus. They were "long" on bees, but needed a family cow. We had a cow we could spare, and an unsatisfied longing for honey. The man assured father it was a very simple and easy matter to have all the honey we could use, and finally persuaded him to exchange the cow for three of those boxes of bees. It was a sort of 'milk and honey' arrangement from which we expected great things. After father led the cow away and brought the bees home, he remarked that he "guessed he'd played the fool," but we children were delighted. We had bees of our own, and we had been led to think that meant unlimited honey. Possibly too much honey had been taken from them before we got them, or the man selected weak colonies or the spring was unfavorable. Anyway, we never saw any bees in one of those hives. Those in another, dwindled away and perished before midsummer. The third swarm survived, and that hive was occupied by bees for many years. My folks tried to follow directions about handling and feeding them, and putting on, and taking off surplus cases, but soon became disgusted, as well as disappointed. They got little honey, and hived no new swarms.

Soon after we got those bees I left home to attend school, then went to the extreme frontier to make a fortune, got married, starved out, and moved back to the old home neighborhood in '93.

In the meantime, bees had increased in that section with astonishing rapidity. Half the farmers were keeping bees, the hollow trees were full of them, and they had invaded a good many houses, between the siding and the plastering. In midsummer swarms flew over the fields looking for places to establish themselves. I had grown up on the frontier and knew nothing about the habits or the handling of bees, except what I had read in the farm papers, but others were keeping them successfully, and I wanted to try.

One day in June, when we were at dinner, with doors and windows wide open, a swarm passed over a corner of the kitchen. Some one said "bees," and in an instant we resolved to try to get them. The hired man grabbed the washbasin and a tincup, the girl got the dishpan and a tin kettle cover, the wife picked up a bell, the baby got excited and began to cry, and I got the water pail and dipper. Well, I imagine we surprised those bees, and we surrounded them a few rods from the house. Everyone made all the noise possible, and I threw water among them with the dipper, and when the water was gone, dipped up earth, and threw it.

It is possible we made a trifle more noise and fuss than was absolutely necessary, but we confused and stopped them, and they clustered on a small apple tree. The hired man was a young "Cracker," fresh from Georgia and he knew a "right smart grain" about bees. He "reckoned we all orter tote a gum an' put 'em in, an' if th' ole king bee war projickin' araoun' among 'em, they'd stop." We had no "gum," so I made a box of footwide boards, without a cover, and by the advice of the man, nailed a couple of sticks across near the top, "ter hang th' comb ter." He had "seed his pap swarm bees a right smart," and advised rubbing the inside of the box with peach leaves, and washing it out with brine. We followed directions in this, cut the branch with the cluster of bees, stuck it in the box, shook off the bees, and clapped the wife's kneading board on, for a cover. Then I bored an inch hole in one end of the box and waited results. At dinner the next day the man said he "reckoned we jes' nachelly got th' ole king bee f'r shore." About this time the wife suggested that she would need the kneading board next morning, and I decided that if we were to keep bees it would pay to get a modern hive, and transfer them. I drove to town, got a hive and all the information I could, and borrowed the "A, B, C, of Bee Keeping." It was late when I reached home, but those bees were transferred to the new hive that night, by lantern light. They made about fifty pounds of surplus honey that summer. In July we stopped another swarm, and they made more than twenty pounds of honey in the super. We have kept bees, and had all the honey we could possibly use at all times, ever since.

Aside from the honey they make, there are many reasons why I think every farmer should keep bees. In the pollenization of many plants and fruits, they do a work so useful, and so necessary, that in many cases we may safely say "no bees, no fruit." I would keep bees on this account alone, if they never made a drop of honey.

They are cheerful, hopeful, and industrious. They keep their homes neat, clean and sanitary, and spend no time scolding, sulking, gossiping or loafing. What a worthy and powerful incentive their example should be to each and all of us. To our women folks, especially; for biologists, as well as bee-ologists, tell us that all the worker bees are females.

Solomon may have been the wisest man, and he certainly had exceptional opportunities for studying the greatest problem of the ages—women—but he showed a lamentable lack of judgment when he set up the ant as an example. Ants are always gadding aimlessly and fussily about. An ant will pick up a piece of feather, glass or butterfly wing, within a few inches of, and in plain sight of, home. She will carry it about for hours, over sticks and stones, up one side of a tall weed and down the other, to the top of every grass blade within reach, and finally drop the useless thing, when her mind, or the fashion, changes; only to take up another burden equally useless.

The bee displays no such foolishness, and has no perverted tastes. Her actions are mostly reasonable, sensible and useful. What was Solomon thinking about, anyway?

So the farmer can well afford to keep bees for the example they set. He can afford to keep them for the pleasure, the fascination, and the knowledge that an intimate study of their lives and habits will give him.

But, if none of these appeal, he can certainly afford to keep them for the honey they produce. It is said that in the United States we consume over eighty pounds of sugar per capita annually, and this in addition to the molasses and honey we use. Much of this sugar might well be replaced by honey, which is pleasanter to take, more wholesome for most persons, and may be had for little trouble or expense. On two and a half square feet of ground you may set a modern hive; if you can not spare the ground, you may nail it on a post, or in a tree, put it in the garret or on the roof. A number of successful apiaries are located on the roof, in some of our largest cities. So it is not necessary to own a farm, or live in the country, to keep bees. And it need not be expensive. There is probably no place in Nebraska where a swarm of bees, two dovetailed hives completed, a smoker and a bee veil, may now be had for ten dollars, or less—the price of a small calf or two small shoats—the price of one cheap cigar a day for six months. The extra hive is for the first new swarm, so that for this price you obtain two colonies of bees, with up-to-date hives and fixtures. You will be pretty sure to get interested in them, grow enthusiastic, and want more. With this start, and good care, you may reasonably expect to double your number of colonies each year. This alone, is a hundred per cent increase. The honey and the pleasure are extra. The amount of pleasure varies somewhat, and so does the quantity of honey. Ordinarily bees, like domestic animals, are profitable in proportion to the intelligent care given them, but the care required by bees is very much less for a given return.

In my own case the bees do not rank second or even tenth, among the industries of the farm, and are shamefully neglected, yet I am sure they pay better, in proportion to the attention they receive, than any other industry on the farm. In the spring, and at various times during the summer as I happen to be in the mood, I put on supers. In the fall I take them off. Usually leave them on so long that the bees have carried some of the honey below to fill up empty brood comb, but that simply means we get less honey, never have to feed the bees and they do not starve during the winter. The entire time given a dozen colonies is probably less than half a day per year. We save much time, and get more honey, by using shallow extracting supers, instead of the ordinary sections. We do not extract, but sell chunk honey, in two-quart tin pails. Occasionally a colony gives no surplus, while others give as much as sixty or seventy pounds. We eat a great deal of honey, give away considerable, and usually have honey to sell. And it is practically all clear profit, too.

The farmer buys hundred dollar land, hires hands, boards them, keeps teams and expensive machinery, to raise corn; and feeds it to four cent hogs—if they escape the cholera—and he has to feed and look after them every day. Or he buys cows and feeds them at a cost of thirty dollars each, and slaves to milk them twice a day, and sells the butter-fat for $30 or less. He must own land to pasture beef cattle, and grow hay and corn to feed them, and is in luck if the returns show a net profit. He slaves all summer to grow grain, and often receives no more for it than the actual value of the fertility it takes from his soil. And so with most of the farmer's interests. They demand capital, constant care, and great risk, to yield a profit, above reasonable wages.

The bee requires no extra acre to grow pasture, or corn, or hay. Does not need to be watered, or milked or fed. Gathers an absolutely waste product and turns it into honey and money, and actually benefits the plants it robs. With a single exception, she is the only domestic animal that actually works for the farmer for nothing and boards herself. The one exception is an industrious wife. The progressive farmer should have both.

MILTON L. TRESTER.

Milton L. Trester was born on a farm near Aurora, Indiana, July 21, 1843. Here he spent his boyhood days. In May, 1864, he enlisted in 134th Indiana Volunteers, and served until the end of the war. On March 20, 1867, he married Harriet Wright, moved to Cincinnati, Ohio, and worked in the railroad shops and at the carpenter's trade for two years. April 2, 1869, he came to Omaha; then walked from there to Elkhorn, and eventually reached Lincoln June 2, 1869. Lincoln then had a population of about 2,000.

In 1871 he took a homestead fourteen miles north of Lincoln, in Lancaster county. For two years Mrs. Trester stayed on the homestead while her husband did carpenter work in Lincoln, walking fourteen miles home on Saturday nights after his week's work was done. He helped on the carpenter work of the first building on the University campus, built in 1870 to 1872, and it is a matter of history that he fitted the casings and sashes of the basement windows of that building. After three years of homestead life in a new country when conditions seemed a little brighter, the grasshopper scourge of 1874 and 1875 came and destroyed all crops for two successive years.

In 1880 he bought a few stands of bees. In 1883 he sold his homestead, which was one of the best farms of 191 acres in Lancaster county, for $25 per acre. In the summer of 1883 he took twenty-five colonies of bees and moved to Greenwood, Neb. By February 1, 1884, he produced and marketed $800 worth of honey. Following this year of good honey crop his apiary of 300 colonies was found to be diseased with "foul brood," which was carried in combs and bees shipped from Illinois during the summer. With a hope of complete destruction of the disease and discovering a cure, the entire apiary, except about fifty colonies, was gradually destroyed, at great expense to the owner, and in the firm conviction that there was no cure for "foul brood" except complete destruction by fire.

In 1884 he located on a twenty-acre tract, which was then a cornfield, two miles northeast of the Lincoln post-office. Here he kept an apiary of about 100 colonies for some years; also he was a breeder of Poland-China hogs until the cholera wiped out almost the entire herd in 1887. When the Missouri Pacific Railroad ran into Lincoln it laid its tracks through the middle of the twenty acres. This caused another change, and the acreage was platted into town lots, known as Trester's Addition, and taken into the city limits. In 1888 he was engaged in the lumber and coal business on North 27th street, where he was interested until the time of his death.

He was foremost in all the public matters of interest and benefit to East Lincoln, and was also enthusiastic in helping to build up the capital city of the state. In 1885 he was appointed by the official board of St. Paul's church to superintend the construction of Grace M. E. church. It was always his desire to do everything well and go to the bottom of every problem that faced him. His progressive spirit was shown in some of the positions he held in some of the various societies in which he was interested. In 1884 or 1885 he judged hogs at the Burt county agricultural fair, and was the first man in the state to use a score card. He was the first president of the Nebraska Swine Breeders' Association. He was a member of the executive committee of the Nebraska Lumberman's Association. He was president of the Lincoln Lumber and Coal Dealers' Association. He was president of board of trustees of Grace M. E. church. He was president of the business men's display and street parade at time of state fair in the early 90's. He was chairman of the finance committee on the celebration of Nebraska's twenty-fifth aniversary as a state in 1892. He was secretary of the Nebraska Beekeepers' Association from 1883 to 1885. He was president of the Nebraska Beekeepers' Association from 1889 to 1890. He was president of the Lancaster County Sunday School Association in 1896 and 1897.

He was foremost in many movements favoring prohibition in the city and county. He was a man of decided opinions, and strong convictions of right. He respected and advocated the highest ideals of life in all his dealings.

He was not in his usual health for several years prior to his death, but was able to look after various interests. He died on November 16, 1903, after a severe illness of three days. He was survived by his wife, three sons and two daughters.

The two papers below were read before the Farmers' Club which used to meet every fortnight in the University when Governor Furnas, Professor Bessey, and Professor Wing were actively introducing such work in the state. The meetings were held in one of the rooms in the old building ("University Hall") and many papers were read by men then prominent in agricultural work in the state, most of whom are no longer with us. These papers were prepared for publication long ago, but through some chance they were mislaid. They are too valuable to be allowed to drop out of sight, and are now published for the first time.

I.

BEE CULTURE OR APICULTURE.

BY MILTON L. TRESTER.

This subject is receiving more attention in America now than ever before. National, state, district and county bee-keepers' associations are rapidly organizing on every hand. Merchants, doctors, ministers, lawyers, farmers, professors of our literary institutes and even our most highly refined ladies are being charmed by the pleasure and profits of handling the honey-bee.

The bee-keeping of today is not done in the same manner it was fifty years ago, no more than our grain is harvested in the same manner now that it was then. Honey is demanded now by the ton instead of by the ounce, and can be had at almost any of our leading groceries instead of only at our drug-stores, as is was less than a quarter of a century ago; and the beauty of it all is, every farmer of ordinary intelligence may, with some study, enjoy the profits and pleasures of that untiring little worker, the honey-bee.

The bee-hive is an emblem of industry and economy, and when we become acquainted with its government there are many things that seem truly marvelous, and many things are found that the deepest scientific research has as yet been unable to fathom.

Until between thirty and forty years ago the opportunities for studying the working of a colony of bees in a hive were rather limited. But at about the above date the Rev. L. L. Langstroth, now living at Oxford, Ohio, but very feeble, invented the movable frame hive, for which invention he is highly esteemed and reverenced as the father of modern apiculture. His invention consists in furnishing frames or sashes which are about three-eights of an inch smaller all around than the inside of the hive, and inducing the bees to build their combs in them. And the accuracy and precision with which they do their work almost leads us to believe that they have learned to use the plumb-line, straight-edge and rule.

The standard Langstroth hive of eight frames is the one most used in the United States. A frame is about nine by seventeen inches and contains over six thousand cells for storing honey or raising young bees. The walls or partitions between the cells are about one one-hundred-and-eightieth part of an inch in thickness, and yet the mechanical proportions and construction are so perfect that one-half ounce of this delicate and beautiful structure is of sufficient strength to carry one pound of honey by shipment thousands of miles with ordinary care in handling.

One queen, twenty-five thousand undeveloped females, which are the workers, five or ten hundred drones and ten or fifteen thousand young bees in different stages of development, embracing the egg, larva, and pupa or chrysalis, constitute a colony of bees in proper working order. Some queens are capable of laying five or six thousand eggs in twenty-four hours, but a queen that lays two thousand eggs per day for four or six months in the year is a very good one.

The honey gatherers are all female bees, but do not reproduce their kind only in cases of emergency, and then their offspring is believed to be useless.

The drone is the male bee, and is present in the hive only a part of the year. A young queen will hatch or become a full grown bee in sixteen days from the laying of the eggs, a worker bee in twenty-one days and a drone in twenty-four days.

Beeswax is produced by the bees eating honey, and secreting pure wax on or rather under the segments of their abdomen, and it has by experiment been proven beyond a doubt that the consumption of about fifteen pounds of honey is required to produce one pound of wax or honey-comb. Therefore, for a great many years it has been very evident that if the honey could only be gotten out of the comb without destroying the receptacle in the old way, when our mothers crushed it in their hands and pressed the liquid through a cloth, it would be a great saving, as then the comb could be returned for the bees to fill the second, or even more times.

Major von Hruschka, an Austrian, who was keeping bees in Italy, one day supplied the long-felt want by giving his little boy too much honey to eat. After the boy had satisfied his appetite he placed the remaining piece of comb in a little tin pail and tying a string to the pail began swinging the pail around and around in regular boy style by holding the other end of the string in his hand. Soon the close-observing German noticed that the side of the comb farthest from the boy's hand was emptied of its contents and turning the comb over the boy was bidden to whirl it again, when it was plain to be seen that centrifugal force emptied the other side of the comb in the same way that drops of water leave a grindstone, or the mud flies off a wagon wheel. How simple and near and yet how difficult and far away was all this.

About the year 1857 another German in the fatherland began the use of what is known as comb foundation, but not meeting with success, the foundation business slumbered for nearly twenty years, when Mr. Frederick Weiss, an aged German in New York, began its use. He afterwards having moved to Chicago died in the Cook county poor-house. Foundation is made by dipping a polished board down edgewise into melted wax, which, when cool, is removed from the board like sheets of paper and then passed through a machine similar to a clothes wringer, which stamps indentations on each side of it for the base of the cell, when the bees will readily accept it and build the cells.

A complete honey-comb has never been made by man yet, and I feel safe in saying that one never will be, notwithstanding a certain Professor Wiley has said that honey-combs were being manufactured, filled with honey and capped over by machinery, but when asked for his proof be crawled out by saying, "It was only a scientific pleasantry." But about once in three months our bee periodicals are called upon to explain the Wiley prevarication, and he has done the apiarists a great deal of damage by reporting as a scientific man what he know was not so.

The shipment of bees has been so perfected that a queen and about one dozen bees are now put in a cage, made by boring a two-inch hole in a block of wood three or four inches square, and then put in the daily mails and sent throughout the length and breadth of the land. In June last a queen was placed in the mails at Jerusalem, Palestine, and after being in the mails twenty-six days arrived in Pennsylvania, United States, in perfect condition.

There is a great deal of experimenting going on now to find the best race of bees. We have the black, or German bee, found in the United States and in Europe north of the Alps; the Italian, found south of the Alps; the Cyprians, Syrians, Holy Land Carniolan and some other varieties, but as yet the Italians have more admirers than any other race. Bees are now handled so that the race or blood is being improved in the same manner as our other domestic animals by selecting from the best.

They are today not less than one-thousand or may be fifteen hundred bee-keepers in the state of Nebraska, having from one to three thundred colonies each. It is nothing surprising or unreasonable to hear of a colony of bees gathering from three to five hundred pounds of honey in a season. At a convention of bee-keepers held at Chicago in the fall of 1884, embracing the northwestern states, sixty-four persons reported 4,462 colonies of bees in the spring, and 6,304 in the fall, with a total of ninety-nine tons of honey gathered, being an average of ninety-eight colonies per man and an average of forty-five pounds of honey per colony.

In November, 1883, Mr. C. F. Wurth, a honey commission merchant in Cincinnati, had on hand at one time 200 barrels of honey, and at the Toronto Exposition, 1883, D. A. Jones, of Beeton (Ontario), Canada, one of the largest apiarists in the world, had on exhibition fifty tons of that delicious, palate-tickling, pure nectar.

II.

HOW WILL WE HANDLE OUR BEES TO OBTAIN THE MOST HONEY.

BY MILTON L. TRESTER.

This, Mr. President, is no doubt the paramount question in bee-keeping, and I know you will excuse me when I say that it is just as difficult to give the above subject justice in this short essay, as it would be to give all the details in the management of a small farm in an essay of the same length; and really I hardly know where to begin in order to interest my listeners most, but as "dilly-dallying around never accomplishes anything," I will dive into my subject and touch a few important points.

You all remember that in a former essay I told you that it took twenty-one days from the time a queen laid an egg until a worker bee hatched or was a full grown bee; it is also about five days from the time it is fully matured or hatched until it is old enough to go to the field.

The life of a worker bee is from forty to fifty days at the time in the year when they have the most labor to perform, which is of course in the summer, while in the winter they will live six or eight months. It appears that they are similar to a machine, the more they exercise the sooner they are used up, or worn out. Now you see from what I have said that you cannot have the same bee all summer to work for you.

On the other hand, honey is not to be found in the flowers at all times in the warm months, and here in Nebraska the flower itself is rather difficult to find in the forepart of the summer, and excepting in the eastern counties of the state our honey flow does not really begin until about August 1, and it then is principally from heartsease or smartweed, as it is called by some persons. It is now easy for any of us to understand why it would be foolishness for a beekeeper to have a hive full of bees in May here in Nebraska with which he expected to gather the August crop of honey. A farmer would use just as much judgment in hiring men in May to help cut his oats in August for in both cases the laborers must be boarded, and in case of the bee, it would be dead, while the oats harvester—well you would be disgusted with him to say the least. Now, then, how are we going to solve this problem? How can we have our hives full of bees just when we want them? If you will only be patient I will tell you how. In the first place every apiarist should know just at what times in the seasons to look for honey flow, or more properly speaking, he should know at what time the flowers will come in bloom, that are accustomed to secreting the most honey, and about twenty-six days before that time he must see to it that his queens are just doing their level best at egg laying.

Well, you say, how are you going to make a queen lay eggs whether she wants to or not? Why you must play a kind of a "snide game" on the old lady and make her want to lay. It can be done by feeding almost any sweet substance if there is no honey flow. It is a well known fact that when a honey flow begins the queen will begin to lay eggs. She seems to reason instinctively that as there is a harvest to be gathered more laborers are wanted, and when the honey flow ceases she seems to say there is nothing to do now and we want no more boarders to eat up our hard earned stores, and ceases to deposit eggs at once. Therefore here in our our state examine your combs closely about July 1, or rather June 25, and if the tiny eggs are not plentiful in the bottom of the cells you should proceed at once to feed for stimulative purposes, when the queen will at once proceed as I have stated. By attention you will easily learn how much to feed so that it will all be used up before the bees begin to bring in the pure honey, because if you leave any of the feed to be mixed with the honey it will not be agreeable to your customers or very pleasant for yourself when they come at you roughshod about the quality of your honey.

Now we are ready to have the honey gathered and what are we going to do with it? The bees will not put it in jugs and cork it up for us. neither will they store it in bottles or barrels. Honey comb we cannot give them because we cannot make it, and it would be foolishness in my estimation to allow one-half of the bees to stay at home to secrete wax and build comb, while honey was going to waste in the fields, and so far we have been unable to induce them to build comb except during a honey flow. But I will tell you what is the next best thing we can do, to furnishing comb, and that is to furnish plenty of comb foundation. And I almost see you shaking your heads in doubt when I say that in twenty-four hours after foundation has been given I have seen it drawn nearly out into a perfect comb and partially filled with honey. And now being your harvest time, you should peep into your hives often to just get an idea how fast they are filling up with honey, and when they are nearly full take some of the ripest or oldest looking honey away, leaving plenty of room for them to store in, for if they get the hive entirely filled they may slacken their energy. If it is comb honey you are working for it should be removed as soon as it is capped or the cappings will become dark, caused by the bees traveling over it so much.

If you will allow me to deviate from the subject, I will say that it is an easy matter for an expert apiarist to tell when his bees are finding honey. They come out of the entrance of the hive with a "hop, skip and jump" and away they go, in calm weather, with almost the speed of a bullet; when the wind is doing its best they seem to be all the more determined; they will tack to the right and left, then up and down, but, "don't you forget it," they will get there on a bee line if it takes all day and until after sundown. I have heard bees come home heaily laden with honey so late in the evening that it was too dark to see them. I think I can safely say that each one hundred and sixty acres of land that is under cultivation in eastern Nebraska would support forty colonies of bees and if that was the case there would not be so many beautiful flowers "born to bud and bloom and die unseen, and waste their fragrance on the desert air," neither would the millions of dollars worth of pure and healthful sweets be permitted to evaporate in the dazzling sunlight while a health-destroying glucose was being used in its stead.

HOME CONVENIENCES AT SMALL EXPENSE.

BY LULU S. WOLFORD.

A certain minister received an invitation to accept another charge, but declined. His young son insisted upon knowing why he declined and his father carefully explained that the *call* was not *strong* enough. A few evenings later this same son was proceeding to "raise Cain" in his father's study while the good pastor was laboring over the preparation of his next Sabbath's discourse. Finnally in exasperation his father offered him a dime if he would betake himself to some other part of the house. The boy hesitated, pondered a moment, then shook his head decisively. "Nope," he replied, "Can't do it. Call isn't strong enough." Now, ladies and gentlemen—yes, gentlemen, for I find that the gentlemen are as deeply interested in this problem as the ladies—I hope by this article to make a very strong call to you. So strong that every one of you will feel the need of availing yourselves of at least some of the inexpensive conveniences which I shall suggest.

It is stated on good authority that the average housewife takes over two miles of unnecessary steps every day in the performance of the ordinary household duties.

The problem confronting us is how to arrange our work so as to minimize the amount of labor required in its performance.

Under the topic of Home Conveniences I wish to discuss certain practical devices for the saving of labor, and many advantages to be gained thereby will appear. I wish to discuss this under three heads:

First, the operator, or the housewife.

Second, the field of operations, or the house.

Third, the means of operations, or labor-saving conveniences.

In discussing the first head—the housewife as the operator—I am reminded of the lady who purchased a new sewing machine. She studied her instruction book very carefully and came to the conclusion that she didn't know how to run the machine, so she sent for the agent. He arrived upon the scene and said: "Well, madam, what seems to be the trouble?" "Well," she replied, "this instruction book says to turn the wheel toward the operator, and I've looked and looked and I just can't find the operator."

The housewife is the operator of the machinery of the household and a very complicated machinery it is, and how essential that she should be able to so turn the wheels as to operate it with the least possible friction. In order to do this it is necessary that she should have a sound body, steady nerves, well trained faculties, and flexible muscles. And in order to have these it is necessary that the body should be taken care of. Most of the friction in household machinery is due to overwork, or ill health brought on by exposure.

For instance, Mary bends over a low tub or back-breaking washing machine and wringer, and then wet with steam and perspiration goes out into the cold air, perhaps wades thru snow or mud and hangs out the clothes. She may not feel any immediate effects from this exposure, but the laws of health have been transgressed and a foundation is laid for colds, rheumatism, or more serious complications.

Now this can be greatly simplified. In the first place, Mary should have a good high washing machine with easy gearing and wringer attached so that she can do the work without stooping, thus enabling her to do the work with her arms and not with her back.

Now, to save her all needless exposure in hanging out the clothes try this device: Put your clothes-line on a couple of pulleys or well wheels, one attached to the corner of your house or porch and the other to a post or tree at the far end of your line. Then starting with one wheel carry your line out around the other wheel and back to the starting point, firmly fastening the ends together. Then all that Mary will have to do is to stand on the porch and pin on her clothes, drawing the line towards her as she needs it. When the clothes are dry she removes them in the same manner and never sets foot into mud or snow. Of course, this device takes just as much again clothes-line as the old method—but then clothes-lines are cheap.

Every housewife should have a good high ironing board; then when she sits down to do the mending after the ironing is done she will not be so tired that she will want to sit on the small of her back.

It is a good plan to have a high stool to sit upon while ironing, preparing vegetables, etc. Then, if you want an expensive luxury that is decidedly cheap, get a gasoline iron. This may sound like a contradictory statement, but allow me to explain. This iron is expensive, costing from $3.50 to $5. It is provided with a tank, holding one-half pint of gasoline, which is enough to do an ordinary ironing. With gasoline at fifteen cents per gallon, the cost of one ironing is less than one cent, thus making about fifty cents per year. But double that to be certain the estimate is not too low, and call it $1. The estimated average cost of fuel for doing an ordinary ironing is thirty cents per week, making over $15 per year. Need I carry the comparison farther? One can readily see that this iron will save the equivalent of its cost in fuel in a very short time to say nothing of the comfort and convenience gained by its use.

Mary can sit on her high stool and do her entire ironing without taking a single step, and can have her iron at any temperature she may desire simply by turning a thumb-screw.

Now, John, don't you consider this worth while? When you come in to dinner Mary will greet you with a smile and not with a frown, and peevish complainings of weariness.

But to take up the second part of our subject, namely, the field of operations, or the house itself.

We cannot all have new houses, but those we have can be made much better than they now are. A little careful thought will save a surprising amount of labor. Look to the furniture arrangement. A little shifting of cabinet, table or range may enable us to take but four steps where formerly we took five.

THE KITCHEN

In planning our homes the kitchen is usually the last room considered. It should be the *first*. Is it not a fact that the average housewife spends the greater part of her time in the kitchen? Therefore it should be the pleasantest room in the house. Is it not also a fact that the greater part of the household labor is performed there? Then it should be so constructed and arranged as to minimize this labor.

The size of the kitchen depends largely upon the requirements of the family. A small kitchen saves steps. But if the laundry work is to be done there, or if it must serve as kitchen and dining-room combined it must necessarily be larger.

The kitchen should be bright and cheerful, and the treatment of walls and ceiling has much to do with this. The prevailing treatment is using wall paper. The entire kitchen must be papered every year in order to keep it looking well and layer after layer of paper goes on the walls which is unsanitary to say the least. One dollar a year is a conservative estimate of the cost of the paper, and you must do the extremely hard work yourself or be at the expense of at least another dollar for the services of a paperhanger. In ten years time you will have paid $10 for wall paper, and have performed the hard task of paperhanging ten times, or have been at $10 additional expense, making a total of $20.

Suppose, instead, you cover your walls and ceilings with oilcloth at fifteen cents a yard, employing a reliable paperhanger. The maximum cost ought not to exceed $6 or $7, and you have a covering that will last indefinitely. I know of two or three instances where the selfsame oilcloth has been on the wells ten or twelve years, and is in good condition. You have a wall than can be washed and looks as good as new—which is not true of paint, or any other wall covering—is sanitary, satisfactory, and cheaper than paper. I would suggest the use of light colored, or white oil-cloth with little or no design, something inconspicuous that will not become offensive or tiresome to the eye.

The kitchen should be well lighted and ventilated, and all furniture should be arranged and planned with the view of saving labor.

DUMB-WAITER.

Discussing the third head, means of operation, I wish to speak more particularly of certain labor-saving conveniences.

The first one in order is the dumb-waiter. This is a device operating between kitchen and cellar and used for raising and lowering articles. Figure 1 is a very practical device and so simple that it can be constructed and placed in almost any kitchen at a trifling cost. Even an

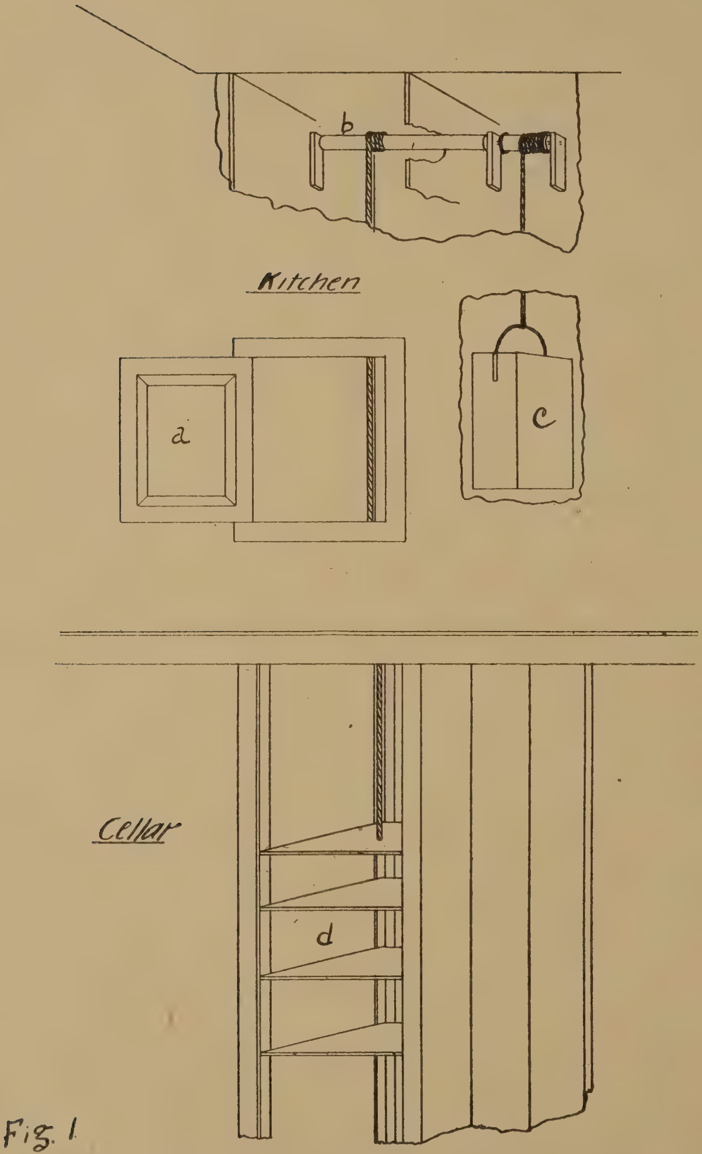
b
Kitchen
a
c
Cellar
d
Fig. 1

FIG. 1.—Dumb waiter in kitchen. *a*, door in kitchen wall; *b*, roller; *c*, weight, *d*, waiter.

amateur can make it. It consists of a box (2x2x3, with two shelves, is a good size) suspended between four uprights extending from the cellar floor to the kitchen ceiling. It may be enclosed and finished against the side of the kitchen (as is sometimes done in making chimneys), or placed back of the kitchen wall. The method of construction is shown in the cut.

By carefully planning the day's work almost everything that will be needed from the cellar during the day—fruit, vegetables, eggs, meat, etc.—can be placed on the dumb-waiter in the morning and all can be raised and lowered from the kitchen at will, thus obviating the necessity of carrying anything up or down the steps, and doing away with many daily trips up and down a flight of stairs. It is really astonishing how many trips the average housewife makes to the cellar; and if she tips the beam at from 175 to 200 avoirdupois these trips are laborious indeed.

At certain seasons the waiter is especially helpful. In summer it will take butter, cream, etc., to the cellar for you, and it is almost indispensable in the fall when you are putting up fruit and vegetables. It will gladly brig up a load of empty jars, and when you have filled them will cheerfully take them back, and you have only to descend the stairs empty handed and put them away.

I have known of these dumb-waiters being put in at an expense of $5, and the maximum cost of putting one in an old house ought not to exceed $8 or $10.

Very few farms are supplied with ice, so many housewives will welcome suggestions that will help them solve the problem of keeping food cool. A dumb waiter may be used in an open well or cistern and gives excellent results.

Figure 2 shows a thoroly practical device, which consists of a long narrow box (*a*), having a hinged door and fitted with several shelves. This is suspended from a common well wheel (*b*) and balanced with weights (*c*). A car-coupling, discarded sad irons, or a bag of sand will serve very nicely for weights. A piece of board (*d*) is placed in the well two feet above the water and directly under the cross piece supporting the wheel. Two long wires (*ee*) are carried from the cross piece at the top (*f*) and fastened in this board. Three or four staples are driven around these wires and into the sides of the box, thus holding it in position as it slides up and down between the wires, so there is not a possibility of its tipping or spilling anything into the well. Butter, milk and cream are kept cool in this dumb-waiter, and meat can be kept perfectly in it for several days. The cost of this device need not exceed $1.50.

KITCHEN WAGON.

The kitchen wagon—which is but another name for a small table on castors—is a convenience every home should boast. These castors should be ball-bearing, so that the table can be rolled readily in any direction and this can not be accomplished with the ordinary castor.

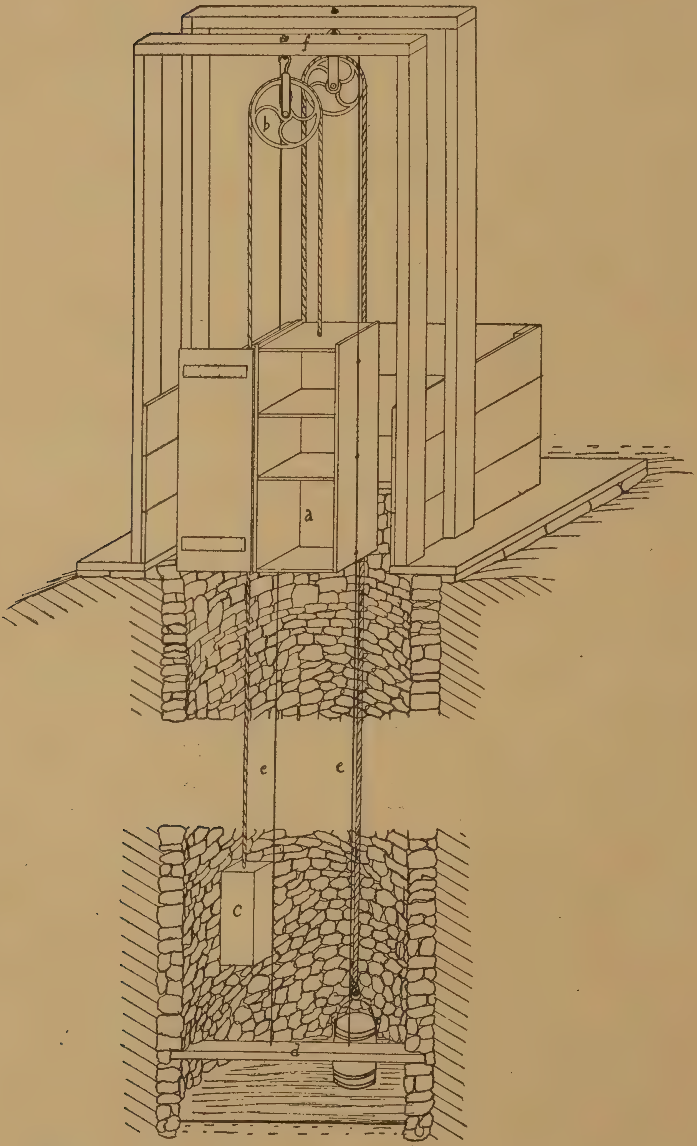

FIG. 2.—Dumb waiter in well. *a*, long narrow box; *b*, large wheel; *c*, weight; *d*, board 2 feet above water to which wires are attached; *e*, *e*, wire supports; *f*, top cross-piece.

This table saves many steps in conveying dishes and articles of food from kitchen to dining-room and vice versa. All the dishes for setting the table can be taken on this wagon at one trip, and one trip more brings every article of food. This wagon commends itself where the meal is served in courses. Any small table may be utilized in making it, or a table may be specially designed, provided with zinc top, rounded edges, rubbered corners, shelf, etc.

WATER SUPPLY.

One of the greatest needs in the farm home is a continuous supply of fresh water *in* the house.

Almost every farm has its windmill to supply water to the barn, the yards, and elsewhere. Why not utilize this same windmill in supplying water to the house?

Gentlemen, did it ever occur to you that the housewife uses more water every day than is required for all the stock on the average farm? Let us see. She washes the dishes three times a day; she washes the clothes, windows, floors, porches, walks, churn, milk vessels, separator. vegetables —yes, and the children's faces, to say nothing of the cooking and many other things for which water is required—and all of this water must be *carried* in.

Who carries this water? Why of course John does—not. John has to have that windmill because he cannot carry all the water necessary for the stock, but he never thinks of how much water Mary must use every day. Now, gentlemen, I don't want to say anything unpleasant, or make you uncomfortable, for we women, too, are just as thoughtless about these matters, so I am not going to scold you any more. But listen. You can put a five-gallon tank in your kitchen with a pipe from the windmill to carry the water in, and an overflow pipe to carry the surplus back to the barn, and lay these pipes underground deep enough to prevent freezing, all for $5. In this way you can have a constant supply of fresh water in your kitchen, and all the good wife will have to do is to turn the faucet. Or if you cannot afford this you can at least have a barrel at the house and pump it full every morning.

AN EXCELLENT DEVICE.

A progressive young farmer in the vicinity of Hebron has solved this problem in a very practical way. The solution cost him just $14, has been in use over four years, and he assured me they could not do without it. It is such a practical and simple plan that I cannot refrain from giving it. *a* in figure 3 represents a galvanized cylindrical reservoir 18 inches in diameter and 9 feet long, placed close to the windmill and sunk 4½ feet into the ground. The portion above the ground is incased in well tubing which effectually prevents freezing or other damage to the tank. All water pumped from the well passes thru this reservoir by means of a pipe (*b*) connecting between the pump and top of the reservoir. A simi-

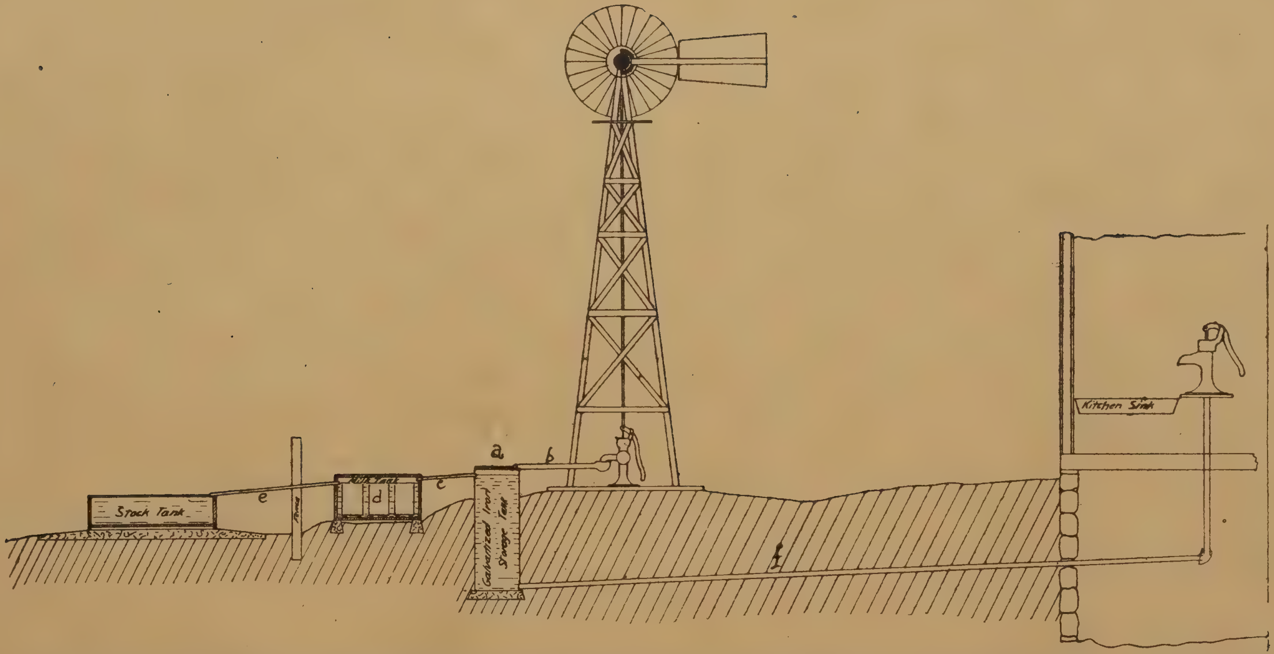
Stock Tank
e
Milk Tank
d
c
a
Galvanized Iron Storage Tank
b
f
Kitchen Sink

FIG. 3.—A practical device for bringing water into the house. *a*, storage tank; *b*, pipe connections; *c*, overflow pipe to milk tank; *d*, milk tank; *e*, overflow pipe to stock tank; *f*, pipe leading to kitchen.

lar pipe laid underground leads from the bottom of the reservoir to the house and supplies the pump at the kitchen sink. An overflow pipe (*c*) a few inches from the top of this reservoir connects with the milk tank (*d*) whence another overflow pipe (*e*) leads to the stock tank. All these connections are one inch galvanized pipe purchased at 8 cents per foot.

This device insures a constant supply of fresh water in the kitchen. By means of a T-shaped pipe the bath room can be supplied with very little additional expense.

By this method the water can be piped any distance, and uphill, providing the kitchen pump is not more than 25 feet above the surface of the water in the reservoir.

DRAINS.

Another of the housewife's problems is the disposition of waste water. How many women have to carry all waste water to an outside door, and perhaps down several steps and out into the yard where it is thrown on the ground? This necessitates many steps, and an ill-kept, unsanitary yard results.

A sink could be placed in the kitchen with trap connection to a tile drain, thus saving many steps, much hard lifting and an untidy yard.

The drain should be large enough to permit the washing of vegetables in the sink. Four-inch tile can be had at 7 cents a foot, and the drain should extend 25 feet or more from the house, depending upon the slope and location of the well.

The expense of the drain is slight:

25 feet glazed tile	$1 75
An iron sink	1 25
Pipe and trap connections	1 00

The drain can be dug by the farmer at odd times and the actual cost, then, will be $4 for a permanent means of carrying off waste water from the kitchen.

A few suggestions are appended in the hope of further aiding some Mary and John in the lighter operating of their household machinery.

Stop and think how many things are needed before traveling to the cellar. "Make your head save your heels."

Wear a large apron made of white oilcloth when washing, preparing vegetables, etc.

Try using a pair of scissors when cutting up chickens.

You cannot get along without a food chopper. Use it to grind meat scraps, bread crusts, and other left overs, thus making many palatable dishes from what would ofttimes be wasted.

Keep a little brush for greasing pans and avoid soiling your fingers.

Clean potatoes with a vegetable brush which you can purchase for five cents.

Have your pantry on your kitchen walls and save steps.

Hang a small slate on the kitchen wall with a pencil attached by a string. Jot down anything you think of that you need or want to remember.

Get a small alarm clock. Set it at the time you want to look at your bread, pie, or cake and go on with your sewing or other work until the alarm tells you it's time to investigate. Use it when cooking meat, fruit, vegetables, and the little clock will cheerfully do its duty and be company for you as well.

Experiment on cooking in a hay box or fireless cooker and you will find it indispensable. Try it for raising your bread.

Try the three-hour method of making bread, using compressed yeast.

A window-cupboard saves many trips to the cellar and keeps things cool.

A drop shelf is very simple and convenient and economizes space.

A wire dishcloth for cleaning kettles costs but a few cents.

A spatula is useful in scores of ways.

CORN MACHINERY.

BY L. W. CHASE.

With the advent of high-priced lands and the scarcity of farm help there are two problems of vital importance before the farmer today; they are: more intensive farming and the ability to do more work with less help. In both cases the question lies with the machinery for the farmer to use. To accomplish results from intensive farming, implements must be such that the best of tilth is produced. To care for the large farms with less help requires that more ground must be covered at one time by one man, that is, two-row machinery, combined plows, harrows and drills, and like implements must be used.

The farmer who now has extensive corn fields must, when possible, resort to two-row machinery and in some instances even the three-row machine must be used. In the operation of two-row machinery there is just twice the work for the operator to look after as in the one-row, consequently the man who attempts to handle such machines must not be a "catch-as-catch-can" farmer, but he must be educated to his work, and even then he must have all conditions the best in order to produce as good results as when he used the single-row implements. In the most simple of two-row, shovel cultivators there are seven levers to be handled and, in some cultivators, this number runs as high as ten and eleven. There are instances when all of these should be operated within the same few seconds. This, of course, is impossible; consequently, there are times when either a weed must be left, or corn covered or pulled out. To make the use of the two-row machines as simple as possible the ground must, first, be as free from weeds as possible; second, it must be well tilled before planting; third, the rows must be straight and with a uniform distance between each; fourth, if the corn is checked, the checking must be perfect; and, fifth, a steady and well-trained team must be used. It is impossible to get within from fifteen to thirty inches as close to the fence at the end of the rows with a two-row cultivator as with a one-row, the distance varying with the number of horses used. For the first cultivation of listed corn there can be nothing better than the two- or three-row sled or solid-wheel cultivator with a disk to work the earth.

Since to obtain the maximum yield of corn per acre the proper planting of the corn is as important as the proper cultivation, and since there is not time for the discussion of both subjects, the remainder of this paper will be devoted to corn planters and sorters or graders.

The modern corn-planter is made up of five principal parts, the rear frame, wheels, check head and front frame, furrow openers and dropping devices. The rear frame is carried by the axle between the covering wheels, its usual duty being to connect the front frame with the wheels and also to carry the driver.

The wheels of the planter fulfil two functions; one is to support the planter and the other is to cover the corn. As to height, there are two general classes of wheels, known as high and low. The former has a height of about thirty-eight inches and the latter about thirty-two inches. For those who list and then drill their corn with a drill planter, the high wheels are preferable, while for those who top plant it is optional as to which they use. Each of the above classes of wheels can have for form of tire the flat as seen by Fig. 1, or the concave, Fig. 2, or the open, as in Fig. 3, or the wheel may be made up of two parts and be known as a double wheel (Fig. 4).

The flat wheel was the first type to be used on corn-planters. It served the purpose at the time, but, by considering Fig. 1 it will be noticed that the flat wheel leaves practically a level trench with a smooth surface. The center of this trench being softer, due to the fact that the soil has just previously been stirred by the furrow opener, the water will gather at this point and soon wash down through, getting at the kernels of corn. Again, the planter wheel having packed the dirt down where the corn has been dropped and having left the surface of the ground perfectly smooth gives us the best condition of soil for evaporation.

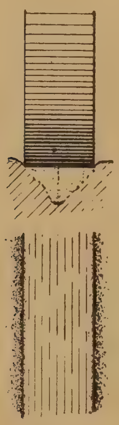

FIG. 1.
Flat wheel.

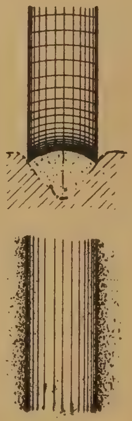

FIG. 2.
Concave wheel.

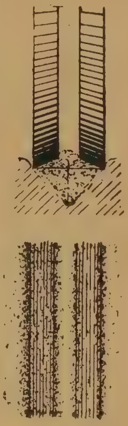

FIG. 3.
Open wheel.

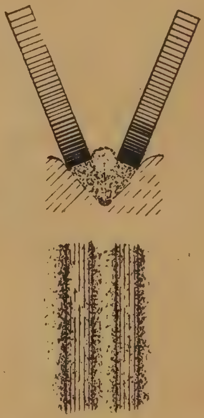

FIG. 4.
Double wheel.

By noticing the lower part of Fig. 2, it will be observed that the concave wheel leaves the ground beneath in the same hard condition with a smooth surface that the flat wheel did but, at each side of the wheel track, but at each side of the wheel track the ground is lower than in the middle, consequently, as the water gathers in the wheel track, it washes down through these low points and, unless there is a great deal of water, it will not reach the hill of corn. In many cases, this simple method of throwing water from the center of the wheel track to the outside saves replanting a great deal of corn.

The open wheel is probably the wheel which is used more than any other type. It has the effect of packing the dirt around the corn; also, it leaves a small trench at each side of the middle of the row and yet does not leave a smooth surface from which the moisture will evaporate. The dust will fall in over the tread of each part of the open wheel and make what is known as a dust mulch; what is more, there is more of the gathering effect in the open type of wheel than in the closed type, and for this reason it is more sure of covering corn.

The double wheel has all the points of the open wheel and is generally so constructed that the angle of the slope of the wheel is changeable and, for this reason, the double wheel can be given more or less gather as the case demands. For a tricycle lister this is an important function. The double wheel pulls harder than any other type of wheel and, in addition, has two bearings to be cared for; for the latter reason it is not as popular with the public as the open type.

Outside of the dropping devices, probably the furrow openers are as important as anything on the planter. There are five general types of openers now in use. They are the hoe, the curved and stub runner, also the single and double disk. The hoe was the first type to be used and has long since become obsolete on corn planters The curved runner was and is yet probably as serviceable as any. Its draft is probably lighter and it can be used in more varied classes of soil. Its greatest objection is the fact that in trashy ground it will run over the trash and generally it so happens that the hill is dropped just where the trash comes, consequently, there is no dirt to cover the corn. For the man who desires to get over a great deal of ground in a short time, the curved runner is more satisfactory than any other. The stub runner has a greater penetrative effect than the curved; it also noses through the trash, thus leaving the corn in the ground. However, the trash will occasionally gather in front of the shank and require the operator to get off and remove it. This is not a bad feature to anyone except the man who prefers losing a few hills of corn to getting off and cleaning his machine. The stub runner cannot be used in stony and stumpy ground. The single disk probably has greater penetrative effect than any other of the five classes of runners given, but it also pulls the hardest. As a rule it will cut through trash, thus hindering neither the operation nor the operator of the planter. This style of runner, however, requires a very much heavier support than either of the previous named styles, due to the fact that a disk has a tendency to draw itself to one side or the other and thus cause a planter to wind. On high-wheel planters this point is quite objectionable, but on low-wheel classes it is scarcely noticeable. The double-disk opener is being used quite extensively and seems to be giving very good satisfaction. It does not have quite the penetrative effect that the single-disk does. However, corn should not be planted in ground where any of the openers spoken of have difficulty in going in. Some men have criticised the double disk by saying that it allows the dry dirt to fall backupon the corn instead of the fresh earth. The writer cannot verify this statement, however.

The Illinois Experiment Station has done a great deal of work in determining which is the best depth to plant corn. Their observations have indicated that about one and one-half inch is the proper depth. In a locality where there is always plenty of moisture, no doubt this depth is sufficient. However, there are places where the corn should be planted deeper to obtain the best results. The proper depths can be determined only by the men who are in certain localities, and when the proper depth is decided upon those who plant the corn should adhere strictly to the rule. If the corn does the best when planted two inches deep, it does not do quite as well when planted one and one-half or two and one-half, and it is no harder work to put in at just the proper depth than to have it vary one-half inch either way. There is now put on planters a device known as a depth gauge. This is merely a shoe, which prevents the runner from going more than a certain depth into the ground. It is very good, but there are other devices which appeal much more strongly to the writer for the same purposes, and at the same time they have their features which are commendable. These latter devices are known as furrow openers or furrow-opener extensions. It is simply a sheet of steel bent in a form similar to the common mold-board, one for each side of the furrow opener. When a runner strikes a place where it penetrates the ground four or five inches, these extensions plow the dirt away from the runner in such a way that they always leave the corn just at the proper depth, regardless of the fact that the runner may start as if it were going into the ground four or five inches. What is more, they turn over four or five inches of the soil on each side of the runner, and by so doing kill one crop of small weeds. Besides these furrow-opener extensions, there is also a device known as covers, which is very satisfactory on ground which is inclined to be rutty. They rake the dirt in over the corn and also cut off a strip of weeds along the sides of the row.

The timing of the corn-planter is an important part of the operation. To produce good results by timing, we mean that the planter shank is so adjusted that the hill is always dropped almost directly beneath the bead on the check wire. A man may go to the pains of setting a line across each end of his corn field, and then each time set his check wire stake on this line so that he will apparently have his corn in check, but if his planter is not properly timed the checking can be off as much as five inches. Also, by changing from a high team with short breast straps and not adjusting the planter, the corn can be thrown out of check from three to five inches. Some planters have an adjusting device on the rear end of the pole, such that it is easy to keep the planter properly timed. Other planters have to be timed simply by lengthening or shortening the breast straps. A new planter should be timed before going to the field. When it has been properly adjusted, the height of the end of the tongue from the ground should be measured and marked upon the tongue. A good plan is to cut the figures into the planter tongue with a knife or dot them in with a nail, then every time a different team is put on the planter the breast straps may be so adjusted that the end of the tongue is the proper height from the ground.

The dropping device is, without doubt, the most important feature of corn planters. The early dropping devices were automatic. That is, they were so made that the wheels dropped the corn. However, machine-dropped corn was very seldom checked in those times, and when checking was attempted it was done in a very uneven manner. When people commenced checking their corn more extensively, planters were constructed so that a second person rode on the front frame and dropped the corn by means of a lever which worked the seed plates. In such cases the fields were always marked cross ways before the planter was started. The next device and the one which is used at the present time was the check wire. By the use of the check wire the second person on the planter is done away with; the trouble of marking the field is also dispensed with, and, if proper care is taken, the corn is much better checked with this device than with the old-time method.

The dropping device of the lister is simply a plate which revolves in the bottom of the seed box and is propelled by a chain running from the main wheels of the lister or from a special wheel placed for that purpose. This plate is so constructed that only one kernel can get into each cell and the distance apart of the kernels is regulated either by the speed of rotation of the plate or the distance apart of the cells in the plate. When the corn leaves the cell it falls directly down through a nearly vertical spout to the opening made by the subsoiler in the ground. Since some of the kernels of corn may strike one, two, three, four or even five or six times on the side of this spout as they fall down through it without striking the sides of the spout, the corn is not dropped at a uniform distance apart. That is, one kernel will be retarded in passing through the spout, while the next one will pass through without stopping. The result is these two kernels of corn will be closer together in the ground than the previous two. Planters are made in a similar manner, but there are devices which cause the hills to be dropped at a uniform distance apart. These devices are valves in the spout or shank of the planter. In nearly all modern planters there are two valves and sometimes three. The first valve is generally near the top of the shank; this valve receives the corn from the plate, and when the check head is thrown the valve is opened and the hill falls to the next valve, which is generally at the lower end of the shank. As soon as the corn drops from the upper valve to the lower a new hill is received in the upper valve, then when the corn is dropped from the lower valve to the ground, the hill in the upper valve is dropped and caught by the lower valve, ready for the next hill. By having this lower valve in the shank the corn can drop directly upon the ground without passing through the long passage. By so doing each hill is left a certain distance apart providing the team works at a uniform pace. If the team should be working too fast, the planter will carry the corn a short distance after it leaves the valve before it strikes the ground; for this reason there are some valves so constructed that they tend to throw the corn backward when the team is working too fast. The valve action of planters is important in that it regulates the distance apart of the hills and also it prevents two hills from being dropped at once. This is one of the most difficult operations of the valve, and few planters are so well constructed but that when a team goes slowly enough two hills will drop at once, and then the next time no hill be dropped. This will occur only when the planter strikes some obstruction, such as a large clod or stone, and jerks on the team, causing it to slow down, or it will occur if the check head is being thrown just at the instant the team stops at the end.

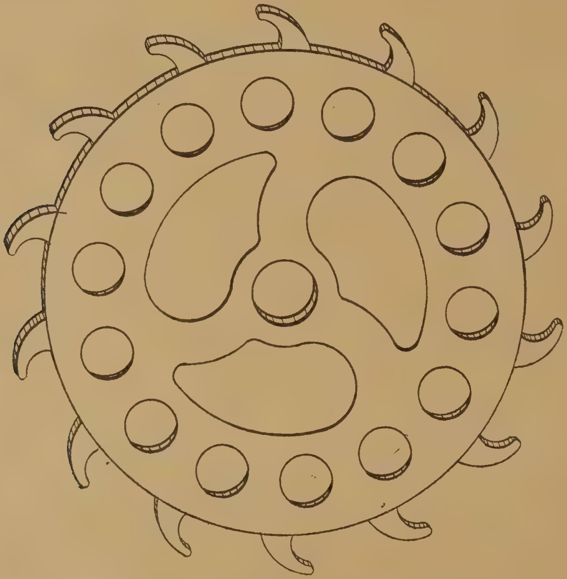

FIG. 8.—Round-hole plate for full hill drop.

The operation of the drop is the vital part of corn-planters. Corn cultivation has reached such a stage that it is found that the greatest yields are produced only by having the proper number of kernels in each hill, and for that reason manufacturers are putting themselves to a great deal of expense to make their planters so that the proper results may be accomplished. The first corn planters had the cells or holes in the plates of a size which would admit of enough and only enough kernels to make a hill, and if the number of kernels in each hill was to be varied a plate with either larger or smaller cells was used in the planter, as the case called for. This style of dropping mechanism was known as the full-hill drop. That is the full hill was accomplished by having the hill of corn gather in one cell of the plate, Fig. 8, and the plate then moved only far enough to permit this cell to pass over the opening to the planter shank. The present-day planters do not use this method because of the fact that when corn varied in size, instead of about three kernels getting into each cell in the plate, four or five small ones could get in the same cell at once, and possibly in the next hill there would be only one or two large ones. The result was that the corn was not evenly distributed among the hills. Nearly all modern planters now use what is known as the accumulative hill. These planters are so constructed that the number of cells corresponding to the number of kernels desired in each hill will be exposed to the valve long enough for the hill of corn to accumulate. For instance, if a hill of three kernels is desired, the plate will have a kernel of corn in each cell, then the plate will move so that three cells pass over the opening, thus permitting three kernels of corn to drop into the valve and make the hill. As previously stated, this is known as the accumulative drop. There are two different plate movements for the accumulative drop, also two different classes of plates. The two plate movements are known as intermittent and continual rotation and the two classes of cells are known as round hole, flat plate and edge selection.

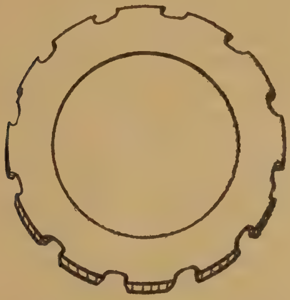

FIG. 9.—Edge-selection plate with intermittent plate movement.

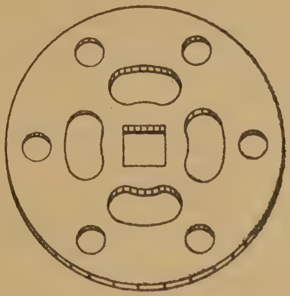

FIG. 10.—Round-hole plate with intermittent plate movement and accumulative hill.

Fig. 9 is one type of edge selection plate used in a planter with the intermittent movement. Fig. 10 is a type of round-hole plate used in the same class of planter.

In regard to the course of dropping of the above named methods, at present I am not prepared to say which would be the best. The edge-selection type seems to be by far the more popular among the dealers at present, but recent tests made with all of the above mentioned systems have not shown a decidedly great difference in favor of the edge-selection types. This probably was because of the fact that the tests were not carried on extensively enough to produce results such as might have been expected, and for that reason I do not deem it best to make a statement concerning the best dropping mechanisms.

CORN SORTERS AND CORN SORTING.

There is no doubt but that a much more accurate drop can be obtained by carefully sorting or grading the corn. Formerly the sorter's attention was to the size and shape of the kernels, expecting that the corn be butted and tipped, and in a great many cases men did not even expect to take this pains with their seed. With the advent of more scientific methods, with corn and corn planting, corn sorters have become of quite frequent use. It is quite essential that the corn be graded or sorted in some manner when edge-selection planters are used, and from recent tests, I believe that it is fully as essential, if not more so, with the old-style planter with full-hill drop. Edge-selection plates are very apt to crack or grind the corn if the corn does not fit the cells perfectly. That is, if the corn is irregular in size and two kernels will endeavor to fall into the same cell, one or the other will be broken and often both are ground up. When the cell is too small for the corn, the corn does not drop into each cell, consequently there is not a full hill gathered. Some operators have experienced the fact that when the planter box has become about two-thirds empty, the corn will no longer drop out. This shows quite clearly that the plate in itself has been a corn sorter and sorted out the small grains from the large ones; also it shows that the corn should have been sorted before being put into the planter, since, when the box is becoming about one-third empty, it will be of quite frequent occurrence to have only one or two grains in a hill when there should have been three.

There are corn sorters on the market which claim to sort the corn in two or three different grades. These sorters generally separate as to the thickness of grain only. Then there are other sorters on the market which claim to sort the corn both as to thickness and length. Some seed corn experts say that careful hand selection is as good as any sorter. The method upon which they advise working is that in selecting seed corn about three barrels be close at hand, when butting and tipping corn notice the size of kernels on each ear, then throw those ears which have small kernels into one barrel; large kernels into another and medium kernels into still another. By this method of selection, three grades of corn are obtained and the expense of a corn sorter or grader is not necessary. Tests were made to determine whether the machine-graded corn or the hand-graded was best. The following is the report of one series of tests, four different styles of planters being used. Because of the fact that this was only one set of tests, the results cannot be used as tests of planters and neither can they be relied upon too much as tests of machine-graded and hand-graded corn.

Planter number.	Corn number.	Number of hills dropped.	Number of hills having ......kernels per hill.							Per cent of hills having 3 kernels.	Total number of kernels dropped.	Proper number of kernels dropped.	Per cent of number of kernels dropped above or below proper number.	Number of stalks lost or gained on one acre.
			0	1	2	3	4	5	6					
1	4	150		7	35	82	24	2	1	54	451	450	0	
1	4b	150	1	6	34	94	14	1		62	417	450	— 7.4	—263
1	3	150		7	41	84	18	3		56	413	450	— 8.1	—288
1	3b	150	*	*	*	*	*	*	*	*	*	*	*	*
2	4	150			4	120	24	2		80	472	450	+ 5	+177
2	4b	150			16	126	8			84	442	450	— 1.75	— 62
2	3	150			20	126	4			84	426	450	— 5.3	—188
2	3b	150			14	131	4			87	441	450	— 2	— 71
3	4	150		1	25	102	22			68	445	450	— 1	— 35
3	4b	150		10	37	91	4			66	405	450	—10	—355
3	3	150		3	35	101	9	2		67	422	450	— 6.3	+224
3	3b	150	1	5	2	97	14			64	432	450	— 4	—142
4	4	150	1	5	13	56	63	9	3	35	514	450	+11.4	+498
4	4b	150		1	25	70	50	3	1	46	477	450	+ 6	+216
4	3	150			22	86	39	5		57	473	450	+ 5	+177
4	3b	150	2		28	104	16			69	432	450	— 4	—142

* Plate was not in properly and test did not count.

Corn No. 4 was butted and tipped but ungraded.

Corn No. 4b was butted and tipped and machine graded.

Corn No. 3 was butted and tipped and hand graded,

Corn No. 3b was butted and tipped, hand graded and also machine sorted and graded.

From this series of tests it will be noticed that the ungraded corn produced results only 60 per cent accurate, while the corn which had been both hand and machine graded gave results of 74 per cent accuracy, or 14 per cent in favor of the extremely carefully graded corn. It will also be noticed that the hand-graded corn produced 65 per cent accuracy and the machine graded 66 per cent accuracy. There will be interrogations as to why more accurate drops were not obtained. Four styles of planters were used; the old-style round-hole, full-hill drop, the round-hole, flat-plate, accumulative-drop, the edge-selection accumulative-drop with intermittent plate movement, and the edge-selection accumulative-drop, with continual plate movement. If modern improvements have anything to do with making planters drop more accurately than the old style, it will be a result that the old-style dropping system averaged in with the new system would lower the final average. As there are yet so many of the old-style planters in use, these tests were made to cover all.

FARM MACHINERY.

BY L. W. CHASE.

"One of the requirements for a steady, healthy growth of any people or nation is a bountiful supply of food. The earth can be made to produce in abundance only when the soil is tilled and plants suitable for food are cultivated. As long as the people of the earth roamed about obtaining their subsistence by hunting and fishing, conditions were not favorable for a rapid increase in population or an advance in civilization. Tribes or nations constantly encroached upon each other's right and were continually at war. History shows that when any nation, isolated so as to be protected from the attacks of other nations, devoted itself to agricultural pursuits, its government at once became more stable and life and property more secure. Protected in this way, a great nation, shut off from the rest of the world by natural means, and located in a fertile country, arose along the banks of the Nile long before any other nation reached prominence. The Gauls became mighty because they devoted themselves to agriculture and obtained in this way a more reliable supply of food. Pliny, the elder, in his writings tells of the fields of Gaul and described some of the tools used. It has been estimated that there never were more than 400,000 Indians in North America, and they were often in want of food. Compare this number with the present population. The tribes that flourished and increased in numbers were those who had fields of grain and a definite source of food.*

"2. *Change from Hand to Machine Methods.*—When people began to turn their attention to farming they began to devise tools to aid them in their work. Various kinds of hoes, crude plows, sickles and scythes were invented, but were practically all hand tools. Work with these was necessarily very laborious and slow. The hours of labor in consequence were very long, and the social position of the tiller of the soil was low. He was in every sense of the term 'the man with the hoe.' He became prematurely old and bent; his lot was anything but enviable.

"For more than 3,000 years the farmers of Europe, and in this country until after the Revolutionary war, used the same crude tools and primitive methods as were employed by the Egyptians and the Israelites. In fact, it has been, relatively speaking, only a few years since the change from hand to machine methods took place. In the Twelfth Census Report the following statement is made: 'The year 1850 practically marks the close of the period in which the only farm implements and machinery, other than the wagon cart and cotton gin, were those which, for want of a better designation, may be called implements of hand production.'

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* Introduction to Farm Machinery and Farm Motors.

"McMaster, in his 'History of the People of the United States,' says: 'The Massachusetts farmer who witnessed the Revolution plowed his land with the wooden bull plow, sowed his grain broadcast, and when it was ripe cut it with a scythe and threshed it out on his barn floor with a flail.' He writes further that the poor whites of Virginia in 1790 lived in log huts 'with the chinks stuffed with clay; the walls had no plaster, the windows had no glass, the furniture was such as they themselves had made. Their grain was threshed by driving horses over it in the open field. When they ground it they used a rude pestle and mortar, or placed it in a hollow of a stone and beat it with another.'

"3. *Effects of the Change.*—At any rate, a great change has taken place, and all in a little over a half century. This great change from the simplest of tools to the modern, almost perfect implements, has produced a marked effect upon the life of the farmer. He is no longer 'the man with the hoe,' but a man well trained intellectually.

"4. *Physical and Mental Changes.*—It is not difficult to realize that a great change for the better has taken place in the physical and mental nature of the farmer. It is vastly easier for a man to sit on a modern harvester, watch the machine and drive the team than it is to work all day with bended back, shuffling along, running a cradle. How much easier it is to handle the modern crop, though much larger, with the modern threshing machine, where the bundles are simply thrown into the feeder, than to spend the entire winter beating the grain out with a flail. The farmer can now do his work and still have time to plan his business and to think of improvements.

"5. *Length of the Working Day.*—One of the marked effects of the change to modern machinery methods has been a shortening of the length of the working day. When the work was done by hand methods, the day during the busy season was from early morn till late at night. Often as much as sixteen hours a day were spent in the fields. Now field work seldom exceeds ten hours a day.

"6. *Increase in Wages.*—According to McMaster,* in 1794, 'in the states north of Pennsylvania' the wages of the common laborer were not to exceed $3 per month, and 'in Vermont good men were employed for £18 per year.' Even as late as 1849 the wages, according to several authorities, did not exceed $120 a year. Under present conditions the farm laborer is able to demand two, three and even five times as much. In countries where hand methods are still practiced wages are very low. Men are required to work all day from early morning till late at night for a few cents. In some of the Asiatic countries it is said that men work from four in the morning until nine at night for 14 cents. Women receive only 9 or 10 cents and children 7 or 8 cents.

"7. *The Labor of Women.*—Woman, so history relates, was the first agriculturist. Upon her depended the planting and tending of the various crops. She was required to help more or less with the farm work as long as the hand methods remained. Machinery has relieved her of nearly all field work. Not only this, but many of the former household duties have been taken away. Spinning and weaving, soap-making and candle-making, although formerly household duties, are now turned over to the factory. Butter and cheese making are gradually becoming the work of the factory rather than that of the home. Sewing machines, washing machines, cream separators, and numerous other inventions have come to aid the housewife with her work.

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* McMaster: "History of the People of the United States," vol. II, p. 179.

"8. *Percentage of Population on Farms.*—During the change from hand to machine methods there was a great decrease in the percentage of the people of the United States living upon the farms. It has been estimated that in 1800, 97 per cent of the people were to be found upon the farms. By 1849 this proportion had decreased to 90 per cent, and according to the Twelfth Census Report it was only 35.7 per cent.

"9. *Increase in Production.*—Notwithstanding this decrease in the per cent of the people upon the farms, there has been, since the introduction of machinery, a great increase in production per capita. In 1800 it is estimated that 5.50 bushels of wheat were produced per capita; in 1850, according to the Division of Statistics of the Department of Agriculture, production had decreased to 4.43 bushels. This was before the effect of harvesting machinery had begun to be felt. People were leaving the farms and the production of wheat per capita was falling off. The limit with hand methods had been reached. Economists were alarmed lest a time should come when the production would not supply the needs of the people. Through the aid of machinery the production increased to 9.16 bushels per capita in 1880, 7.48 bushels in 1890, and 8.66 bushels in 1900. Perhaps this also shows that the maximum production of wheat per capita with present machinery has been reached. The production of corn has also increased, but the increase is not so marked. The production of corn per capita in 1850 was 25.53 bushels; in 1900 it was 34.94 bushels.

"10. *Cost of Production.*—Although the cost of farm labor has doubled or trebled, the cost of production has decreased. According to the Thirteenth Annual Report of the Department of Labor, the amount of labor required to produce a bushel of wheat by hand was 3 hours and 3 minutes, and now it is only 9 minutes and 58 seconds. The cost of production, as compiled by Quaintance,* was 20 cents by hand (1829-30) and 10 cents by machinery (1895-96). It is also stated in the Year Book of the Department of Agriculture for 1899 that it formerly required 11 hours of man labor to cut and cure one ton of hay. Now the same work is accomplished in 1 hour and 39 minutes. The cost of the required labor has decreased from 83⅓ cents to 16¼ cents a ton. Not only is it true that machinery has revolutionized the work of making hay, but nearly every phase of farm work has been essentially changed.

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* The Influence of Farm Machinery on Production and Labor. Publications of the American Economic Association, vol. V, No. 4.

"11. *Quality of Products.*—Machinery has also improved the quality of farm products. Corn and other grains are planted at very nearly the proper time, owing to the fact that machinery methods are so much quicker. By hand methods the crop did not have time to mature. It was necessary to begin the harvest before the grain was ripe, and hence it was shrunken. The grain is obtained now cleaner and purer. It would be difficult at the present time to sell, for bread purposes, grain which had been threshed by the treading of animals over it.

"12. *Summary.*—Great changes can be accounted for by the introduction of machine methods for hand methods. For all people this has been beneficial. It has caused the rise of our great nation on the western hemisphere. To no class, however, has this change been more beneficial than to the farm worker himself. J. R. Dodge summarized the benefits derived by the farm worker when he wrote: 'As to the influence of machinery on farm labor, all intelligent, expert observation declares it beneficial. It has relieved the laborer of much drudgery; made his work and his hours of service shorter; stimulated his mental faculties; given an equilibrium of effort to mind and body; made the laborer a more efficient worker, a broader man and a better citizen.'*

"Conditions in America have been very favorable for the development of machinery. We have never had an abundance of farm labor. The American inventor has surpassed all other in his ability to devise machines. By this machinery the farmer receives good compensation for his services and is able to compete on foreign markets with cheap labor of other countries."

As the author of the above has said, social development on the farm has gone hand in hand with the development of farm machinery, and, although the development from 1850 to 1885 was great, there have been as great if not greater changes in the past twenty years. The tendency of the first improvement in farm implements was to do by power what men had been doing by hand; i. e., machines were devised to mow and rake the hay and to harvest and thresh the grain. Now, the desire of the inventors is to increase the work which one man can do in one operation, as to cultivate two rows of corn at once; load the manure into the wagon and spread it on the fields; unload the corn and put it into the cribs, etc. The financial benefit to the farmer by the use of this modern machinery is great, but this cannot be said to be more than half the benefit derived, for now the farmer's hours in the field are shorter and the work is comparatively light. He no longer has to hobble through the soft ground following the smoothing harrow until he is so tired that the evening meal is not enjoyed and the first hours of slumber are lost because of aching bones and tired feet, but he can ride comfortably over the field on his harrow cart and when evening time comes go whistling homeward. The supper is then eaten in a happy, jovial manner and the evening is spent reading or planning the work for the morrow. This is the case not only with the smoothing harrow, but it is also true of all classes of machinery.

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* American Farm Labor in Rept. Ind. Com. (1901), vol. XI, p. 111.

Among the various types of machines which have made the most advancement toward easing and reducing the labors of the farmer within the past twenty years, the following may be considered:

Field Machinery:
  Manure spreaders.
  Harrow carts.
  Two-row cultivators
  Corn harvesters.
  Corn picker huskers.
  Potato machinery.
  Hay loaders.

Farmstead Equipment:
  Barn equipment.
  Wagon dumps.
  Elevators.
  Water systems.

Heavy Machinery:
  Threshing machinery.
  Corn shellers.
  Feed cutters.
  Steam plows.
  Gasoline engines.

FIELD MACHINERY.

Manure Spreaders.—Fertilizer distributors where power was utilized to do the work were first introduced about 1830. From then until the present day improvements have been made until we now have the modern manure spreader, a machine which not only lessens the labor of man very much, but one which excels man in the quality of the work done. A man spreading manure by hand will always throw out chunks just as they were thrown into the wagon. These chunks then fire-fang and are of only about one-half the value to the land which they should be. By the use of the spreader, the manure is not only torn into fine particles, but it is evenly distributed on the ground. It is hard to give the real value of a manure spreader to the average farm, but it is safe to say that every one hundred twenty-five loads of manure hauled out with it will pay the first cost. Many men refrain from the use of a spreader because of the heavy draft. Under no conditions should such an excuse bar a man from the use of so valuable a machine. However, a few of the reasons for this draft will not be out of place here.

First—The average spreader holds two tons of manure, which makes a good load in itself.

Second—If the sills of the spreader are parallel with the ground, the load must be drawn toward the cylinder, hence we have a team moving two tons and a heavy wagon over the soft ground, while, at the same time, this team moves the two tons over the sills of the spreader, making a load of four tons, exclusive of the machine itself.

Third—The cylinder has to grind the load up; that is, pulverize it.

Fourth—The cylinder must raise the load up and throw it out.

Fifth—The load, as it passes back to the cylinder rubs between the side boards and adds friction.

By having the front end of the apron and sills of the spreader higher than the rear end the load is fed to the cylinder on a down grade, thus reducing the draft slightly. By having the rear end of the side boards slightly fartther apart than the front end, the friction between the manure and the side boards will be reduced as soon as the load starts toward the cylinder. However, by such an arrangement, the efficiency of the spreader is reduced. The same results can be obtained by throwing the manure into the center of the spreader and only permitting a small amount of loose stuff to reach the side boards. This, again, in the same manner is referred to above, deprives the spreader of some of its greatest benefits, that is, it does not pulverize the manure as well as it should and neither does it spread it on the ground uniformly. By gazing over a field where a man has loaded his machine in the above manner it will be observed that the manure seems to be spread in rows. Much better results will be obtained from a spreader if the load is evenly distributed over the spreader apron and well tramped down, and the feed set to carry the load very slowly, than to have the load thrown in loosely and the feed set to run fast. By having the cylinder of the spreader set low so that the manure is simply rolled out and not raised as it is thrown out is another method of reducing the draft. However, it will be seen at once that the manure is not likely to be as well pulverized as when the cylinder is well up. In considering the return apron versus the endless apron, there is not a great deal to be said. As a rule, the frame should be heavier and better braced for the endless apron than for the return apron. In either case, however, it is important that the frame be so constructed that it will not twist and bind on the apron. Just a slight twist in the frame will cause the apron to bind enough to increase the draft fifty per cent. The fifth wheel is an important feature of the manure spreader. Theoretically, it should be a ball and socket joint. By having such a joint there is no tendency whatever for the frame to twist. A joint of this type, though, is almost impossible to make so that it will not give trouble. A large fifth wheel is the strongest, but it in turn causes the frame to twist on uneven ground. Most manufacturers are now using a fifth wheel about fourteen inches in diameter.

Wagon-box spreaders are now being put on the market. Such a spreader is simply a wagon box set upon a set of wagon gears, the spreading device being driven in a manner similar to that of an endgate seeder. Such spreaders are to be recommended to the man with such a small farm that he feels that he is not warranted in purchasing a regular machine. On large farms the spreader should always be ready for immediate use and it is much more economical to use it every day, hence there would be the necessity of having a special wagon gear for a wagon-box spreader and then the first cost would be nearly as much as that of a complete machine.

Harrow Carts.—Harrowing is probably the most tiresome of all field labor. It is one of those weary, uninteresting tasks on the farm which have had a tendency to drive so many boys from the farm to the city, and no wonder. The work is dusty, disinteresting, requires no skill and makes a man feel that the world is all against him whenever he has to do it. Wherever possible, there should be an attempt to make such a task pleasant, especially if the boy has to do it, even at the cost of additional horse power. With a careful boy driving, a pony can often be ridden behind the harrow and thus transfer the tiresome, dusty walking from man to beast. This practice, however, is a trifle dangerous, since the pony can easily step into the harrow. Likewise there is danger of the horses becoming tangled if the boy rides one of the team. The harrow cart is the simplest and easiest method, and the expenditure of the ten or fifteen dollars which it requires to purchase one should not be regretted. Even if it is impossible to buy one, a few minutes only will be required to make one from a pair of cultivator wheels or even the cultivator itself may be dismantled so that there are only the wheels, frame and seat left, which may be used for a cart.

Two-Row Cultivators.—A large per cent of our city friends believe that farming is simply a grind of unskilled labor and that any one can farm. This is far from the truth. It requires experienced men to select and carefully handle the live stock, also to make a success of grain raising, and now more than ever it requires experts to handle farm machinery properly. Everything possible should be done to keep the farmer from getting tired. No man who is physically exhausted can have the best control of his mental resources, and to operate our modern farm machinery efficiently requires both skill and experience. This is probably more true in regard to the two-row cultivator than any other machine. Some men say they can do better work with a two-row cultivator than with a single-row. Such a statement cannot be true, although they can probably do as good work with it as with the one-row, providing the following conditions are complied with: If the corn is listed, care must be exerted in the listing that the rows are straight and of a uniform distance apart. A good method to follow is to throw up the ridges with a lister, then follow with a two-row drill. Under no conditions should the weeds be allowed to get such a start that a man has to cultivate his corn to kill the weeds. Cultivate the corn to benefit the corn and while so doing kill the weeds. If the corn is checked, care must be exerted in driving the planter straight and then more care must be used in getting the corn in check. If the corn is not in perfect check it is impossible to guide the cultivator so that it will be doing its best work. The gangs of shovels will cut the corners as they travel from one hill to another in a zig-zag path, hence, if the shovels are set to do perfect work on straight rows they will not do as good work on crooked ones. No matter how skilled the operator is, one shovel will pass too close to the hill, while the corresponding shovel in the opposite gang will be too far from the hill. In operating a two-row cultivator it is essential that a steady team be used, that is, one which will need no attention whatever. In selecting the implement, notice that all levers are handy; that the guides are such that the gangs will respond quickly and through a good distance. The machine should be simple, yet have enough to it so that each set of gangs can be operated independently.

Corn Harvesters.—The present day corn harvester has become so popular in so short a time that it is nearly forgotten that twenty-five years ago all corn was cut by hand and only about twenty years ago it took two men a good, long day to cut and set up six acres with a sled corn cutter. Now one man alone will cut nine acres with ease, and in a long day he will cut ten or more acres. In 1890, D. M. Osborn & Co. introduced a corn harvester to the public. This was about seventeen years ago, and now nearly every half section of land in the corn belt has one.

Corn Pickers and Huskers.—It can safely be said that there has never been as much money spent in endeavoring to develop any other farm implement as has been spent in an endeavor to get a practical corn picker. Although thousands and thousands of dollars have been spent it is only within the last two years that a machine has been produced which was in the least effectual. For the past two years machines have been in use in the central states with a fairly good degree of success. Last year a few machines were tried in this state with partial success. If the machine can be used in the field at just the right time; that is, when the corn is all standing and the stalks are not too brittle, it seems to be a complete success. The farmer can now raise much more corn than he can gather and instead of being limited in the number of acres he can tend, he is limited by the amount he can harvest. When the corn picker-husker becomes a success, and it undoubtedly will be a success in the near future, the hardest and severest work remaining to the farmer will be eliminated.

Potatoe Machinery. Since the advent of harvesters, there has probably been no machine which has relieved the specialty farmer of the disagreeable work more than the introduction of our modern potato machinery. In the past one man has been required to furrow out the ground to receive the seed potatoes, six or seven follow with sacks or baskets on their arms dropping the tubers and finally another man to follow with a cultivator to cover them. Now one man with two horses will do all of this work in the same length of time, and the chances are that with four horses will do all of this work in the same length of time, it will be done better. By the use of the two-row planter, one man with four horses will nearly double the work in the same length of time. There are three systems of drops in potato planters now in general use. They are: a set of revolving spikes which are so designed that the spikes pass up through the hopper of seed potatoes and, as they pass through, each spike spears a cutting and carries it over to the dropping spout, where it is removed by a small arm and allowed to fall into the ground. The second device is to have a system of small buckets on an endless chain pass up through the potatoes and each bucket receive a piece of the seed. These seed pieces are then carried to the dropping spout and dropped into the ground. The distance apart that the seeds are placed in the ground is regulated by the speed of the buckets or the distance they are from each other on the chain. The third device is a system of valves working in a drum in such a manner that as they pass through the potatoes one piece is selected from the rest and enclosed in a pocket until it reaches the dropping spout, where it is released and allowed to fall into the ground. The two former methods have become standards for dropping potatoes, while the latter is yet new to this country and as yet only in its experimental stage.

Successful potato diggers are most efficient as well as economical machines for the potato grower. Digging potatoes with the hoe or fork was the only means of getting all of the tubers, but it was slow and very hard work. Plowing them out with the common stirring plow or lister was much faster, but a large per cent of the potatoes were left in the ground. Even with the plow and lister it was a slow and tiresome process to go over the furrows and the ground to get all of the potatoes possible. Although there are yet some improvements to make to the potato digger, it is even now both a time and labor saver. As with the potato planter, there are three general plans in use for digging the potatoes. One method, which is cheap and to be recommended only to the man who raises a few acres of potatoes, is the use of a machine which resembles the lister, except that the moldboard is removed and a set of rods put in its place, the share plows under the potatoes raising them with the dirt up onto the rods. These rods which are kept in continual vibration, permit the dirt to fall through, but hold the potatoes so that they fall on the top of the ground. The second type of machine, and one which is much more expensive, is known as an elevaor grader. A blade goes beneath the potatoes and dirt, raising them onto an endless wire apron. As the mixture passes up the apron the dirt falls through while the potatoes pass up onto a set of rods which separate them from the trash. A third type, which has only recently been placed before the public, has a blade similar to all the others which raises the potatoes and dirt up onto two sets of vibrating grates, where the potatoes are sorted from the dirt. This device, although more expensive than the second method mentioned, has an advantage over it in that the potatoes are not elevated so high, consequently not so much energy is lost.

Hay Loaders.—The real value of hay loaders in large fields is underestimated. This is especially true in handling alfalfa. By the use of the hay loader and hay fork the whole crop of hay can be put into the barn without touching it with the hand fork. Alfalfa, to be well cured and not burnt, should be as far as possible cured in the windrow. By the use of the side delivery rake it can be allowed to partly cure in the swath, then be thrown into a light windrow where the air can circulate through it, drying it quite uniformly without parching the leaves so that they will fall off perceptibly. The less alfalfa hay can be handled after it is cured the better. To load it with the fork it has to be bunched, then pitched onto the wagon. To load it with the hay loader it can be taken direct from the swath to the wagon. Not only is it better to handle alfalfa with a hay loader but it is cheaper. Assuming that it costs the same to prepare the hay for loading by hand that it does with the loader, the following figures will give a fair comparison of the expense of putting the hay into the wagon by the two methods. On an average, it takes two men about fifty minutes to put on a load of hay by hand. This means one man's time for one hour and forty minutes, or one and two-thirds hours. For one hundred tons this would mean one hundred and sixty-six hours, which, at twenty cents per hour, would be thirty-three dollars and twenty cents. In hay which will make only one ton per acre a man and boy will put on a load with a loader in twenty minutes or less, generally less. This is the equivalent of one man's time for thirty minutes for one ton; for one hundred tons it amounts to three thousand minutes or fifty hours. At twenty cents per hour this will amount to ten dollars, or a saving of twenty-three dollars and twenty cents on one hundred tons. A man who has one hundred acres of alfalfa should pay for a loader in one year with ease. There are two general types of hay loaders. They are the rake loaders and the cylinder loaders. Inasmuch as the rake loaders have a beating motion, they tend to knock the leaves from the stems of alfalfa, while the cylinder loaders with cleated apron carriers scarcely disturb the hay as it is taken from the windrow to the load.

FARMSTEAD EQUIPMENT.

Barn Equipment.—To the farmer who puts all of his hay in the barn the modern hay fork with car and track has been a boon. In the old barns a mammoth driveway was required and always two men in the mow and, as the hay became higher so that the pitchers could not throw it back, the third man was was required, and even then with the mow about full the hay was often thrown upon a scaffold and from there up to the mow, requiring the fourth man to stow the hay away, making in all five men to unload the hay. Compare such conditions with the present, where never more than two men are required in the mow, one on the load and one to drive the fork team. Never, for more than half of the time is there need of more than one man in the mow, and often the mow can be half filled without having any one to throw the hay around. Not only is the number of men now lessened, but the amount of heavy work done by each man is reduced to a minimum; also the time required for unloading has been reduced several hundred per cent. A few figures can well be used to illustrate the actual saving by the present methods. Assuming that on an average only two men be required in the mow where there is no hay fork, then the work being done is two men in the mow for thirty minutes and one on the load for the same length of time or one man's time for one and one-half hours. If one hundred tons are put into the mow, one hundred times one and one-half, which equals one hundred and fifty hours, have been spent in caring for the hay. This at twenty cents per hour equals thirty dollars. By means of the hay fork the same three men could have done the same work in about six minutes and it would have been only good exercise for them. Three men for six minutes equals one man for eighteen minutes and for one hundred tons equals eighteen times one hundred, which equals eighteen hundred minutes or thirty hours. This at twenty cents per hour comes to six dollars, and makes a saving of twenty-four dollars in cost of labor besides making the labor much easier.

Wagon Dumps and Elevators.—The ease with which the farmer has unloaded his corn when he has hauled it to the elevator has long appealed to him as a method which he would like to utilize on his farm. The implement manufacturer has answered this appeal by putting at the disposal of the farmer the wagon dump and elevator. There is not much to say pertaining to the wagon dump and elevator from a mechanical standpoint. They are simple, easy to care for and a great labor saver, just at the time when man is the weariest. The important point to be considered in regard to them is their installation. First. They should be installed where they will fill the entire crib without being moved. Second. They should be so devised that the seed corn may be selected from the crib corn as it passes to the crib. This might not seem essential, but to the seed corn grower it is important and to the average farmer who has large corn fields it will save lots of time. A good way to have the elevator installed, so that seed corn can be selected as the corn passes to the crib, is to have the corn delivered to a conveyer which is located near the comb of a double crib. Have a bin to receive the seed corn near the end of the crib beside the dump. Then the man who is unloading his corn can stand in the comb of the crib beside the conveyor and opposite the seed corn bin and select the seed ears as they come along and allow the crib corn to pass along to its bin. A dump run by a gasoline engine is more satisfactory than by horse power, for then the corn husker can start the dump to work and go to lunch without the necessity of driving the team.

Water Systems.—It took the contractor thousands of years to learn that every time the hod carrier went to the top of a five-story building and returned he had wasted one-half horse power. Should it take the modern farmer with his high degree of intelligence as much longer to learn that every time he carries a pail of water one hundred feet and returns that he has wasted over one-tenth horse power? Of course the pressure tank in the cellar is far more satisfactory than any other scheme for distribution on the farm. By the use of such a system a hot water boiler can be connected to the range; a bath tub can be installed on the second floor, hydrants may be placed in the yard, pressure may be had for flushing the milk-house floors, also the horse and cow stalls as well as the feeding floors for the hogs. What is more, a fairly efficient fire protection may be had. To make water handy around the yards it is not essential that a pressure tank be used, although a system with it can be much more complete. If the stock tank is on an elevation and the well is in a hollow, hydrants may be connected along the pipe from the well to the tank so that water can be drawn off at the various yards, calf lots, hog lots, etc. With such a system, the stock tank acts as stand pipe and storage tank. If the pipe leading from the well to the stock tank does not lead through the lots, pipes may be led off from the tank to the various points where water is needed and otherwise would have to be carried.

HEAVY MACHINERY.

The greatest advancements which have been made to reduce labor in the use of heavy machinery have been made in the cornshellers, threshing machines, huskers and shredders, steam plows and gasoline engines. The advancements in all of the above machines excepting the last have been along the line of reducing the number of men needed to perform certain tasks rather than to lighten their individual exertion. By the use of the extended conveyor on a cornsheller, two men can with ease keep a four-hole sheller supplied with corn from morning until night. Also, if the crib is properly designed, the sheller does not need to be moved until all of the corn in the crib has been run through. In placing the crib, it is also desirable to set it so that the corn can be run into the granary or grain bin direct from the sheller spout. By having the above suggestions carefully worked out and put into use, the labor of three men can be saved during the time the shelling is being done.

Threshing Machinery.—The cost per bushel for threshing has not been reduced to the farmer within the past few years, but the amount of extra help needed while threshing has been very greatly reduced and thus a great saving made to the farmer. With the old machine, two separator men were required, also two band cutters. Now, of these four men, only one is required and that is the separator man, who is always furnished by the machine owner. At the straw stack end of the separator there is a still greater saving of men, since it formerly took four men to care for the straw, now it takes only one and he is generally the separator man. Hence, where it used to require fourteen men to keep a separator running, it now requires only seven or eight, being a reduction of from 43 to 53 per cent.

Steam Plows.—To the farmer who has great fields of wheat to plow, harrow and also to drill, the steam plow has become quite a time saver. Not only does it reduce the time required for preparing the seed bed, but it also reduces the cost nearly fifty per cent. Where fuel is cheap and water handy, the cost of plowing by steam should not be over 75 cents per acre. Where the conditions are not so favorable, this often runs up to $1.25 per acre, but it should never exceed $1.50. If the fields are large enough, harrows and drills may be attached behind the plow and the seed bed prepared and the seed placed in the ground at one operation. Where coal and water are high, gasoline traction engines can often be used in place of the steam traction at a very good advantage.

Gasoline Engines.—The gasoline engine has become a very popular machine for the farmer, in some cases it has become too popular, that is, farmers have purchased them more out of curiosity than as a necessary machine and now they have them on their hands without any special place for them. Again, there are a great many farmers who should have them but do not. It is by no means the least of the virtues of the gasoline engine that its presence makes farm life more attractive to the boys and thus helps to keep them on the farm. There seems to be an inborn spirit in human beings and especially in those of the male sex to have an ever-present desire for handling wheels or something which moves. Let a man be placed in a great museum where curiosities from all countries are gathered, and he will wander about gazing at the novelties and reading the legends for hours without even a thought of touching anything, but let him approach a wheel and there seems to be no power in existence which can keep him from trying the wheel to see if it will turn. It is the same way with a machine which will propel itself—there is something entrancing about it, something which gives the boy who has an opportunity to work with it new life. Let the boy have an engine and so many hours every week to himself with it and in the course of a few years, if he has any mechanical genius at all, he will have done enough work about the farm with it to pay the first cost and, what is more, the boy will have learned to have confidence in himself. He will learn that it does not take a skilled mechanic to hang shafting, that an emery wheel stand can be made on the farm as well as in the factory, that if the farm buildings are properly arranged the gasoline engine can be made to do on stormy days what the job sheller and grist mill men do when the work is rushing, and many other things which to him have seemed to be works that can only be done after years of experience.

There are two general types of gasoline engines, the two-cycle and the four-cycle. The two-cycle engine has one impulse to each revolution of the fly-wheels, while the four-cycle has only one impulse to each two revolutions of the fly-wheels. The cycle of a gasoline engine does not mean a revolution of the fly-wheels, but does mean the actions of the gases within the cylinder until a repetition takes place. That is, in the four-cycle engine one stroke of the piston is required to draw in the charge, another stroke compresses it, while the third stroke, which is the only working stroke of the engine, allows the gas to burn and expand, and then the fourth stroke clears the cylinder of all burnt gases, making it ready for the next stroke, which is the suction stroke again. Thus it will be noticed there are four strokes of the piston to one cycle of operations of the gas. Since there is only one working stroke of the engine out of four strokes, the fly-wheels have to be sufficiently large to store energy received from this stroke to carry them on the remaining three strokes. The two-cycle engine requires only two strokes of the piston to complete the cycle, but the actions of the gas in this style of engine are such that more skill is required to handle it. Since the two-cycle engine receives one impulse for each revolution, the fly-wheels can be much lighter, also the size of the cylinder smaller. Gasoline engines do not have as steady motion as steam engines, for the steam engines receive one impulse every stroke of the piston or two impulses for each revolution of the fly-wheels. Because of the fact that it takes from one-half to three-fourths hours to steam up and start a steam engine, while it only takes from one-half to three-fourths minutes to start a gasoline engine, the latter is vastly preferable to the former for general farm use. Many farmers are making the mistake of installing too small an engine. A small engine cannot be used for enough purposes. If the engine is to be used only for churning, separating milk and pumping water for the house and stock, a one and one-half horse power or two horse power is sufficiently large, but these uses should be only about one-half of the purposes for which an engine can be advantageously used. Use the engine for grinding feed, husking and shredding the corn, shelling, cleaning seed, running an emery wheel, and besides these there are many more. Where shelling, feed grinding and such work are to be done with the same engine that pumps the water and runs the milk separator, a six horse power is to be recommended. Of course, an engine of that horse power is too small to run a four-hole sheller, but it will run a three-hole sheller, also a grinder which has a capacity of fifty bushels per hour. For shelling with a four-hole sheller, doing commercial work, it is advisable to use a ten-horse engine, although an eight-horse will do the work if the corn is in good condition. For commercial threshing nothing less than a twenty-five or thirty horse power engine should be used.

The location of buildings has a great deal to do with making an engine satisfactory and economical. By careful study, the buildings can be so arranged that one engine situated in one place can do all of the work. Quadrants can be used to connect the engine with the pump and often a wire cable or an extended shaft can be utilized to connect to some misplaced machine. Where the buildings cannot be arranged to use an engine, situated in one engine room for all the work, a semi-portable engine or a portable one is advisable. Where a portable engine is to be used, it is generally preferable to use either an open-jacket, cooling system or the circulating-pump method. Either one of these systems requires only a few pailfuls of water at a time, hence there is not so much weight to be moved nor so much trouble to drain the engine and tank during freezing weather.

"Gas Power," in the April number for 1907, gives the following table of cost of fuel for a gasoline engine:

Grinds 6 bushels of corn at cost of	2c
Pumps 3,000 gallons of water (50-ft. lift)	2c
Cuts 1½ tons ensilage	2c
Threshes 13 bushels of grain	2c
Shells 40 bushels of corn	2c
Husks 13 bushels of corn and shreds stalk	2c
Separates 800 pounds of milk	2c

FARM BUILDINGS.

BY F. W. CHASE.

As Nebraska is almost exclusively an agricultural state, the construction and maintenance of farm buildings is one of the prime objects of her people. New houses are being built up all over the state so that "the little old sod shanty on the claim" is now almost a thing of the past and few are left of these old relics of thirty years ago.

With the blossoming of prosperity over all the state in the last few years has come the desire for better, more convenient and more commodius dwellings and outbuildings.

It is not the idea of the writer to recommend or to encourage the building of anything of an extravagant nature, but rather to encourage economy coupled with considerable thought in perfecting plans for convenience. A large number of expensive, unhandy, inconvenient, poorly arranged farm buildings which represent nothing but a great outlay of money are no ornament to a rural community or to the farmstead on which they are located and are an emblem of poor judgment on the part of the builder.

Since reliable labor has become so scarce and high priced, it has become necessary for the farmer to so arrange his buildings and plan his work as to get the most possible out of a given time. Therefore, it is necessary that he have his buildings arranged to save all the steps possible, while choring. Many times a few dollars spent to procure the services of a good farm mechanic is money well invested and will return a large profit in the future by the saving of time in having the buildings well arranged. In building over or putting up new farm buildings, this thought should always be uppermost. Convenient for everything and everything convenient.

To build a large, half empty dwelling-house is to throw money away. It costs to keep it in repair and causes a great many backaches and weary limbs for the good housewife to keep it neat and tidy and homelike. Build just the right size for your condition as you expect it will exist.

Put a cellar under the whole house, make it of good depth, light and airy, and so arranged that it can be well ventilated. It will be one of the handiest, most convenient and cheapest rooms of the whole house. An old Yankee, who had lived in Nebraska for several years in one of the regulation huts of frontier life, was telling his neighbor one day that he was planning to build a new house. The neighbor said, "Sam, are you going to put a cellar under it?" Sam's answer was, "Yes, Sir-ee, and it will be the first thing I will build." The old New Englander had learned in early life the comfort and convenience of a good cellar and the recollection of those early days must be manifested in the new house. Don't be led to believe that a clean, airy cellar under the house is not healthful and decide that in its place you will build a cave, so-called, out several rods from the kitchen door for the good wife to go trapesing back and forth through mud and storm when anything is needed for the regular meals. There never was one woman who went to her eternal Waterloo by living over a good cellar where dozens, yea scores, have gone by going to an outside cave and contracting some fatal disease.

Arrange the kitchen so that everything will be handy and don't be afraid of getting it too small unless it is to be used as a living room. In regard to the kitchen, in such cases the size should be regulated by the number in the family. Wherever possible, the kitchen should be on the west side of the house so that during the hot summer mornings it can be made much cooler and pleasanter place for the wife to do her work. Arrange handy places for the utensils with plenty of cupboards and cabinet room.

Where a farmer can afford it, a water system can be installed and it need not necessarily be very expensive. Put up a supply tank either outside the house, or in, and connect it up with piping to the windmill or gasoline engine and connect an overflow pipe with the watering tank in barn lot. In this way there will always be plenty of fresh water for the house. Whether a water system has been installed in the dwelling-house or not, a kitchen sink with drain is indispensable. One can usually find some old boiler tubes that by being placed end to end and having the joints cemented with common Portland cement will make a very good drain pipe with but small expense.

A dumb-waiter should be put in, running from the kitchen to the cellar. It need not be a large one; twelve or fifteen inches square, with two or three shelves, will do all that is required for a common farm house. It need not be complicated; the simpler the better. Get a fifteen-inch well wheel and one-half inch rope. Make a common box, then fill it with old iron, sand, or anything heavy; attach the rope to the waiter, run it over the pulley and attach to the box, which has been filled the right weight to counterbalance the waiter, and it will do the work.

A farmer's kitchen should be supplied with one of the best ranges to be found on the market. There is no implement on the farm used more than the kitchen range or cook stove. The first thing in the morning is to build a fire in it. It is usually in use all day long, 365 days in a year, and the last thing before retiring for the night is to see if it is properly closed. Therefore, get a good range; if it cannot be procured one way, get it some other, but be sure to get it.

I know a farmer who bought a $125 self-binder, going in debt for it when he had only fifteen acres of grain to cut or less than one day's work. He let it stand in the fence corner the balance of the year without a cover to rot and rust out while his wife, without a murmur, was doing her work 365 days in the year with a little old cook stove. "Oh, John just had to have the binder, that was all!" Is there any good common sense in such a way of doing? Yet hundreds of farmers are doing things almost, if not quite as bad, getting some high priced implement that could be dispensed with just as well as not.

The fuel house, instead of being set out several rods from the dwelling, should be joined onto the house with a door opening from the kitchen into it and so arranged with door or window that, as the fuel is hauled up, it can be unloaded right from the wagon into the fuel-house. Such an arrangement not only saves miles of steps, but saves going outdoors in all kinds of weather to get the necessary fuel for the house, while the fuel is kept dry at all times.

The barn should be located as near the dwelling as the sanitary condition will allow. If possible, have the long way of it north and south, or at least have the stable room on the east and west sides. It may be on the south, but the east or west side is preferable, with an alley in the center. Then the stable can have good ventilation during the summer season and plenty of sunlight both winter and summer.

For building a barn, have the mow in the right proportion to the number of head of stock the barn will accommodate; that is, do not make a great hay mow that will hold more hay than will be consumed by the stock that can be stabled in or adjoining the barn. A large mow is all right if one intends selling hay and uses the mow to stock it, but to haul hay and put it into a barn and then haul it out and throw it around to stock is a waste of time. Better far put up a hay shed and make mangers around it so the stock can run to it and feed direct from it.

Barn floors should be cemented as it is much cheaper than lumber, besides being more durable and the annoyance of rats is entirely eliminated. If the concrete is too hard for horses to stand upon, lay some planks in the stalls. It surely can not be any worse for horses to stand on plank laid on cement than it would be to stand on planks laid upon joists.

Scales should be upon every farm and supplied with a movable stock frame so that all kinds of stock can be weighed as well as hay and grain. It is impossible for a farmer to tell how profitably his farming operations are carried on without scales.

One of the greatest leaks, or we might say the most wasteful operation, carried on by the average Nebraska farmer is the neglect given the implements of the farm. From the best of authority it is said that fully 75 per cent of the farming tools used in Nebraska rot and rust out for the want of proper care and protection. A great saving can be made by the Nebraska farmer, who has no tool-house, if he will erect one of sufficient size to hold the tools used upon the farm and see to it that the tools are cleaned and oiled and put away in good shape so they will be ready for business the next time wanted for use.

Stock of all kinds need shelter and must have it to thrive. Fattening cattle and fattening sheep do not necessarily need as much as other stock, but they should have good protection from the wind.

Good suitable shelter for stock can probably be made as economically as any way by setting poles in the ground and boarding up the north and west sides, leaving the south and east open and roofing with good roofing board and bats.

Corn cribs should always be built so that the long way will be north and south, then the sun gets a good chance at both sides and will dry out the corn very quickly after a storm, while if the crib runs east and west, the sun never strikes the north side and when there has been a driving storm or either snow or rain the moisture beats into the corn so far that in some instances it never gets dried out and a consequent loss results owing to damaged corn.

SOIL FERTILITY.

BY C. G. MARSHALL, LINCOLN.

This subject, it seems to me, is one of the most important discussed before the farmers' institutes, because all phases of agriculture are primarily dependent on the soil. The soil is the fundamental factor in crop production. If a man goes to buy a farm the first question he asks is, "What kind of a soil has this farm?" Yet so many followers of agriculture in Nebraska and the midddle west, knowing that nature gave us a soil second to none in fertility in its virgin state, seem to be laboring under the impression that it is inexhaustible and can be cropped continuously year after year to corn, wheat and oats and will never wear out.

It has been said that the American people are the greatest soil robbers in the world. They call themselves developers of the country. Heretofore the custom has been to settle on a piece of land, clear the timber off and burn it up, if it be in a timbered country, impoverish the soil by skimming it until it fails to respond then move on west and start over again. But there is now no more west to go to, practically all of the good land has been taken and it is up to the Nebraska farmer to take care of the land so as to not only retain the virgin fertility, but even add to it.

In eastern Nebraska there are many farms that today will not produce more than half what they produced when first broken. They have been cropped continually to corn, and the crop marketed through the elevator.

The corn-stalks have been burned up instead of being allowed to rot and mix with the soil, thereby putting back some of the fertility that was taken out by the growing crop, and very often the manure that is produced has been hauled and dumped into the creek to get it out of the way, many thinking manure detrimental to the land. And this idea arises from the fact that very often manure is not applied in the right way. Many farms in Nebraska are going the same route that the now deserted farms of New England, New York, Virginia and some other sections of the east have gone. In the New England states and Virginia there are thousands of farms abandoned because the soil will no longer produce crops to pay for the labor and expense expended. It is estimated that there are 12,000 of such farms in the state of New York. And at one time many of these farms were just as productive as Nebraska farms are today.

Many farmers in the central states and practically all farmers in the east are required to spend several dollars per acre annually for commercial fertilizers to make the land produce paying crops. We will be facing the same conditions in a short time unless we change our methods.

We must stop taking from the soil year after year and put nothing back. It will become exhausted just the same as a bank account will become exhausted by checking on it unless a deposit is made occasionally. We must market our corn in the form of live stock instead of selling to the elevator. By this method all of the grain and roughage is consumed on the farm, and if the manure is taken care of and returned to the land we return to the soil between 90 and 95 per cent of the fertility taken from it by the growing crop. The other 5 to 10 per cent can more than be made up for by a proper rotation with legumes and grasses. The legume having the faculty of taking the free nitrogen of the air and placing it in the soil through the bacteria nodules on its roots will keep the nitrogen supply replenished and if we were compelled to buy it on the open market in the form of nitrates it would be very expensive. The manure and rotting roots form humus which makes the soil spongy and capable of holding more water and also helps to dissolve and make available other elements necessary to plant growth by the decomposition. There are other elements that are necessary to plant growth such as potash and phosphorus, but our soil chemists tell us that most of our Nebraska soils have an abundance of these elements and that if we keep plenty of humus and nitrogen in our soils that it will probably be a good many years before we will have to buy commercial fertilizers. And when we can supply these without any outlay of money and at the same time make the leguminous crops pay as large a return as any other crop we can grow, why should we have worn out land?

We must not only retain what fertility we now have, but we must make our land more productive for in fifty years, according to the present rate of increase in population we will be a nation of 200,000,000 people and these people will have to be fed and clothed from the same acres that now feed and clothe 80,000,000 people.

CONSERVING AND INCREASING THE FERTILITY OF THE SOIL.

BY E. W. HUNT, SYRACUSE, NEB.

(Substance of an address delivered before the Franklin County Farmers' Institute and other farmers' institutes in Nebraska during the season of 1908.)

It may seem strange, in a comparatively new state, with a comparatively untouched soil, that one should be called upon to speak on methods for conserving and increasing the fertility of the soil. But let me justify myself a little. New England is thickly dotted with abandoned farms, farms that have been abandoned because under the old methods of cultivation it did not pay to cultivate them any more. I believe that if a hundred years ago someone had gone to New England and talked upon conserving and increasing the fertility of the soil, and the New England farmers had listened to his words, New England farms would today be productive and profitable. Those beautiful eastern slopes of the Blue Ridge mountains in Virginia, that used to produce the finest tobacco in the world, are today good for nothing except scenery. If someone had gone to Virginia seventy-five years ago and discussed this subject there, and the Virginia planters had heeded his words, Virginia would still be growing the imcomparable tobacco of the olden time. Kentucky, where they are burning tobacco warehouses and harrying the tobacco growers, is already suffering from impoverishment of the soil. If they had learned how to preserve their fertility they would have something else to do today than to burn warehouses. There are thousands of acres in central Illinois that used to produce the most remarkable corn in the country, where today corn cannot be successfully grown. Here in Nebraska, we are already seeing indications of an approaching exhaustion of the soil. In the eastern glaciated portion of the state, where the land is rolling, and the glacier has heaped up hills and cut out valleys, the most fertile part of the soil, by our crude agricultural methods has been either exhausted or washed into the Missouri river. Over the great loess plains, that cover the central portion of the state, plains that were originally incomparable in their fertility, making them the garden spot of the world, the same methods are producing the same results. It is high time that we began to study methods for conserving the soil. The wealth of the nation, the prosperity of any state, depends upon the prosperity of agriculture, and there can be no such thing as agricultural prosperity with an impoverished soil.

In this connection I wish to call your attention to a remarkable article by Mr. Samuel W. Allerton of Illinois which appeared in the Saturday Evening Post for January 4th of this year. I wish that every person within the sound of my voice might read that article. The significance of the impoverishment of the soil has so impressed itself upon Mr. Allerton's mind that he has determined to devote the remainer of his life arousing public sentiment in America, with a view of preventing further soil exhaustion. Mr. Allerton is a successful farmer of several thousand acres in northern Illinois, therefore may be supposed to know what he is talking about. He begins his article by saying in substance, that the gravest economic question before the American public today is not the question of the tariff, nor of an elastic currency, nor of the control of corporations, nor any of the other matters that are so freely discussed in newspaper editorials and political platforms of the day. He says that the gravest economic question that confronts the American public today is concerned with the wholesale robbery of the soil.

In order to make this clear to you without being too technical, allow me to call your attention to a few facts. The principal chemical elements of fertility that exist in the soil are nitrogen, phosphoric acid and potash. The average crop takes from the soil of an acre from thirty-five to seventy-five pounds of nitrogen, about twenty pounds of phosphoric acid, and from thirty-five to sixty pounds of potash. Here in Nebraska these elements are worth commercially as follows: Nitrogen, between 18 and 20 cents per pound; phosphoric acid, between 15 and 18 cents per pound, and potash between 7 and 10 cents per pound. How long can any farmer draw, year by year, this amount from his soil and have sufficient left to grow a profitable crop? You have each of you an account in some bank. How long can you keep checking against that account without making an occasional deposit, and not have the banker turn down your checks? I hope none of you have passed through this humiliating experience. Nature holds for every farmer the most wonderful deposit for producing wealth, and you have been drawing on this deposit years without number, without making any additional deposits. How long do you imagine that this process can continue without having nature turn down your checks? I believe that it is possible continually to crop this land, and at the same time to increase both its productiveness and its fertility, and I wish to put before you as briefly as possibly the method by which I think that this may be done.

At the outset, allow me to call your attention to one of the most remarkable facts in the economy of nature. Mature animals make only a limited use of plant food. The part of your growing crop that animals consume is that part that is produced by the sun and is drawn from the air. The part that the plant draws from the soil is practically useless as animal food. Nitrogen is not an animal food. The animal uses comparatively minute amounts of nitrogen, but it forms no part of the staple food of animals. Phosphoric acid is not an animal food, neither is potash. If the growing crop should be fed in its entirety to live stock upon the farm, the mature animals would return in their excretions ninety-five per cent of what the crop took from the soil. Growing animals would return somewhat less. If this should be carefully preserved and returned to the soil, the soil would receive ninety-five per cent of what the crop took from it.

This brings me to the discussion of the use of farm manures, and right here I wish to utter a note of warning. I know that the large majority of the farmers of Nebraska are prejudiced against the use of farm manure, and I will state frankly that I have seen as much land injured by the use of farm manures as I have seen benefited. The benefit depends entirely upon the manner in which they are used. I wish you to take me exactly as I say, and then I will hold myself responsible for any mistakes that may occur in following my advice. But unless this is done, I cannot guarantee that in every instance farmers will receive the benefit that they hope to receive.

In the first place, the value of farm manure depends entirely upon the thoroughness with which it is incorporated with the soil. By incorporated, I mean thoroughly mixed, one grain of soil, one grain of manure, etc. The ideal way to apply it, if it were not so expensive as to be prohibitory, would be to grind it as fine as flour, then it might be readily mixed with the soil. The next best thing is a manure spreader, but not every farmer can afford one of these, and has to use the old-fashioned arm-strong spreader. I wish to suggest a device that will put the mechanical manure spreader and the arm-strong spreader on the same basis, and that is the old-fashioned brush drag, that in the early days was the only harrow the pioneer had to use upon the new virgin soil of Nebraska. Take a stick of timber fourteen feet long, cut some mortises in it, and in these mortises fasten the limbs of trees with the brush all on. Then above these limbs place, what I regard as the indispensable part of every farm tool, a good seat, so that the weight of the driver may hold the brush to their work. Go over the land on which manure has been spread by either of the two methods mentioned above, and this brush drag will pulverize it and grind it up, and put it in condition for thoroughly mixing with the soil. This tool may be made by anybody at comparatively little expense, and it is my opinion that it will double the immediate value of any application of manure. In the next place, our soil has a limited capacity to digest and assimilate, so to speak, the manure which is applied to it. If a heavier coat of manure is given to the soil than it can handle, it will result in damage to the soil, drying it up, burning it, as the farmers used to say. So the only way safely to apply manure, is to apply it in small quantities, and apply it often.

In discussing manure, I discriminate between two different kinds. By stable manure, I mean the dropping of animals unmixed with roughage. If there is roughage mixed with manure, it may be lightly shaken out with the fork so as to leave stable manure, consisting solely of the excrements of the animals. This stable manure should be applied to the soil as soon as it is made. It is rich in nitrogen, and if it is given an opportunity to ferment, the nitrogen escapes in the form of ammonia. Whenever you go into your stable and smell ammonia, you may be certain that you are losing nitrogen, and nitrogen is the most expensive, the most desirable, the most elusive of all the elements of fertility. A neighbor of mine says that if you apply this stable maure as soon as it is made, as a top dressing for the soil, the fertility will evaporate. Nonsense. Nothing evaporates except the water that is in it. You cannot evaporate nitrogen any more than you can evaporate clay. You cannot evaporate phosphoric acid any more than you can evaporate salt. You cannot evaporate potash any more than you can evaporate wood. What happens when it is spread upon the soil is, this stable manure loses its water, which will be replenished by the first shower. By so applying it and preventing its being heaped up and given an opportunity for fermentation, you manage to save the elements of fertility that are contained in it.

By barnyard manure, I mean the waste roughage of the place that has been thoroughly decomposed, separated into its original elements by decay. Before going further with this matter, I wish to ask a few questions, and I want to ask you to be perfectly candid with me. I promise you to be perfectly candid with you, and as an evidence of my candor I will admit, at the outset, that I do not always tell the truth myself. When it comes to shooting prairie chickens or catching fish, anything that I may say on either of these subjects should be taken with a grain of allowance, but when it comes to a matter of such vital importance as agriculture, I promise you to tell the truth, and I ask you to do the same with me.

How many of you burn your straw piles? Come, honest Injun, now, be candid, tell the truth—some of you do I see. A great many of you used to do so. I want to live to see the time when it will be a penitentiary offense to burn a straw pile in the state of Nebraska. How many of you leave your straw piles to rot down where they are, which is almost as bad as burning them? How many of you move your stables or your corrals to get away from the manure heap? How many of you haul your manure into buffalo wallows or sloughs to get rid of it? I tell you that your hope and your salvation, as agriculturalists, lies in the despised, neglected manure heap. Let me suggest a way for making the most of it that you can. Not long ago I met a farmer from Nova Scotia, one of those shrewd old fellows that always shuts one eye when he is saying anything that he thinks is particularly shrewd. I asked him, "What is the principal crop that you raise in Nova Scotia?" He thought a long while, and then shut his eye so hard that I feared he might never be able to get the lids apart again, and answered, "Well, I think the principal crop raised is a good crop of manure. I keep a few cattle, and hogs, and sheep, to help make it, and when the crop is made I sell the cattle, the hogs and the sheep, and apply the manure to the soil."

The time has come when every farmer in the state of Nebraska should make it as much of an object to raise, every year, the biggest possible crop of manure, as to raise a big crop of corn or wheat, or any other grain. Let me suggest a way in which you may do this, and utilize all the waste roughage of the farm. First grade, with plough and scraper if necessary, about the barn lot in such a way that no water may, under any circumstances, wash across it. If the barn-lot is upon a slope, build a dyke across the lower end to prevent loss by leaching. Put eave-troughs up to prevent the roof water from washing the decomposing mass. Then all the moisture that it gets it will get from the skies. Bed down the barn-lot with eighteen inches deep of straw or other waste roughage. Every night turn your cattle in upon it and let them tramp it and lie upon it. It will catch, absorb, and hold all their excrements, with the fertility which they contain. When it is tramped out flat, put on another eighteen inches, and so on throughout the winter, until in this way you have utilized all the waste roughage on the place.

In Nebraska there are thousands upon thousands of acres of cornstalks that practically go to waste every year. I think I can show, before I am through, that it will pay anyone to gather these dead, dry cornstalks, haul them to the barn-lot and have them converted into manure by the animals. All this work will be done during the winter months when the farmer has very little else to do. When spring comes he will have from two to four feet deep of thoroughly rotted, thoroughly decomposed manure, over his barn-lot. This manure has a money value of more than three dollars to the ton. I know a farmer who has recently hauled out sixty loads of manure thoroughly rotted. This is worth, at the least calculation, $180.00. The entire work of hauling straw to the barn-lot, and of hauling out manure, would not amount to more than 80 hours of labor for one man. This would make $2.25 an hour wages for the man doing it. I think that any farmer in Nebraska can afford to cut up his old corn-stalks and haul them to the barnyard, if he is paid $2.25 an hour for doing it. I say that this manure should be thoroughly decomposed, because until thoroughly decomposed and rotted, the elements of fertility that that are in it are not available as plant food. The nitrogen, phosphoric acid and potash, that is contained in this thoroughly rotted decomposed barn-lot manure, becomes available only when the process of decomposition has passed to its last stages.

Now I would not undertake to say that this is a dry country. Every real estate agent would mob me if I said so, and every farmer who has land to sell would feel hostile to me. But I think you will all admit there are times when there is quite a little spell here in Nebraska between showers. Roughage that is not thoroughly rotted and decomposed, besides lying inert in the soil and of no use as plant food, will rob the soil of needed moisture because this moisture will be needed to complete the process of decomposition. So that it is always unwise, for this reason alone, to plow under roughage that is not thoroughly rotted. Roughage that is not thoroughly rotted and mixed with the soil, but is plowed under in bunches, prevents the rise of water from the subsoil by capillary attraction, and the plants growing above it are damaged by lack of moisture.

When shall this manure be applied? You can apply it any time to corn ground. Corn is a gross feeder, and a good coat of thoroughly rotted manure will never work disaster in the cornfield, provided it is thoroughly incorporated with the soil. In some parts of the state it is not wise to manure the soil heavily where the succeeding crop is intended to be small grain, because then the straw graws so rank that the grain lodges before it fills, and consequently does not make a full crop. It is also disastrous to attempt to raise root crops on freshly manured soil. An exception might possibly be made in the case of mangel wurzels.

I know of no place where you can get such immediate and such large returns from an application of manure, as you can when it is applied as a top dressing for alfalfa. You can get almost as great returns when it is applied as a top dressing for pasture. I am going to tell you a pretty big story of the effect of top dressing manure on pasture, but I pledge you that every word of it is true. During the month of January I was in an institute in the city of Blair, Nebraska, and while there I heard such wonderful stories of the success attending the operation of a small dairy farm that borders the city on the southeast that I hired a livery team and went out to see it. George Haller, until last spring, had been for twenty years a clerk in a drug store. He then bought a farm of 31½ acres, paying $7000.00 for it, bordering the city of Blair on the southeast. Twelve and one-half acres of this farm are given up to alfalfa, one-half acre is devoted to garden and building spot. The remainder, eighteen and one-half acres, is pasture, tame grass pasture. This has been regularly top dressed for a number of years. This pasture, during the last summer, carried twenty-seven head of cattle, three horses, five calves, twenty-five head of hogs, twelve geese and one hundred chickens all the time, and he had to mow it in August. You say you are from Missouri and will have to be shown. Well, go to Blair and George Haller will show you as he showed me. When I told this story to Professor Haecker of the state farm, he said to me,, "Professor, you may tell any institute in the state that I am doing practically the same thing with the pasture at the state farm, but I mow my pasture twice every season because when kept short it furnishes more feed than when allowed to grow up rank and high."

Put manure on stubble, and plow it under. If you haven't any other place to put your manure, put it on your pasture, and it will doubly repay all the labor and time expended upon it. By thus feeding upon your own farm the grain that you raise, and returning the excrements of the animals that feed upon the grain, together with all the waste roughage of the place, to the soil, you are returning to the soil fully ninety-five per cent of what the crops took from the soil. Any man who hauls his grain to an elevator, is hauling the best part of his farm to the elevator.

Whenever you sell off from your farm one ton of timothy hay, you sell four dollars worth of fertility. Whenever you sell a ton of clover hay off the farm, you are selling $7.55 worth of fertility. Whenever you sell a ton of wheat off the farm, you are selling $8.49 worth of fertility. Whenever you sell a ton of corn off the farm, you are selling $6.75 worth of fertility. If a farmer reckons, as he should, the fertility of his soil as a part of his assets, how many of you can say that you are making money? Of how many may it not be true that you are exchanging, at a loss, the fertility of your soil for money? I believe that it would cost the majority of the farmers in Nebraska more to buy in the open market the elements of fertility that the average crop takes from the soil than they receive for the crop when sold. They are simply using up their capital, selling it for less than it is worth. Hitherto the farmers of Nebraska have been exchanging the fertility of their soil for money. The time has come when they must exchange the labor of their brains and of their muscles for money, and must adopt every expedient, not only to keep the fertility of their soil intact, but to increase it with each succeeding crop.

The use of manure has added advantages besides restoring to the soil the fertility which the crop took from it. It changes, or helps to change, the granular structure of the soil, putting it in a condition more favorable for plant growth. It also gives to the soil a spongy texture which enables it to take and to hold increased quantities of water. If you take common loess soil and evaporate it to dryness, and take one hundred pounds of it, this one hundred pounds of dry loess soil, if water is applied to it slowly as the rain would apply it, will hold from forty-seven to forty-nine pounds of water without leaking. One hundred pounds of thoroughly dried, decomposed vegetable matter will hold, under the same conditions, one hundred and forty-three pounds of water without leaking. You can see at a glance that a mixture of the decomposed vegetable matter with the loess soil would vastly increase its capacity for holding water. A plant takes all its food in solution, and that it is a very weak solution is evident from the fact that it takes three hundred tons of water to produce one ton of dry matter in dent corn. It is evident, then, unless there is sufficient water in the soil to dissolve the plant food, that the plant will starve for lack of nutrition, and this is what really happens when we say that our corn is firing. It is starving, there is not sufficient water in the soil to dissolve the plant food and make it available for plant use. By the use of manure, giving to the soil a spongy character which enables it to hold water, the farmer can prevent washing, or the running of free water upon the surface of the soil. Nitrogen, which is, as I have said, the most expensive, the most necessary and the most elusive of the chemical elements of fertility, is as soluble as either salt or sugar. The minute water begins to run upon the soil, it carries with it the dissolved nitrates, and away goes your nitrogen. So that manure properly applied and mixed with the soil, is a means not only of receiving and retaining great quantities of water so necessary for the growing crop, but it also prevents the waste of the elements of fertility through leaching and washing.

I wish to propose an experiment for each one of you. Every one of you should be an experimenter on his own farm. Most of your agricultural problems you will have to work out for yourselves on your own places, under your own peculiar conditions of soil, moisture, and climate, by patient, careful, accruate experimentation. In agricultural, as well as in spiritual matters, you will have to "work out your own salvation, with fear and trembling." The experiment I propose is this. Take a small quantity of clean river sand. Wash it till there is nothing but sand left. Dry it to absolute dryness, and weigh it. You will then know just how much sand you have. Then mix with it an equal quantity of thoroughly rotted manure, and expose it for a year to the natural rainfall. Then wash, dry and weigh as before, and you will be astonished at the amount of sand that the acids in the manure, assisted by the dilute nitric acid in the rainfall, have broken down, and converted into soil. Some valleys in this state are a sandy loam. Others are a loamy sand. Then there are the sand-hills, which are nothing but sand. The proper use of well-rotted manure will help to break down the sand into soil, will enable it to receive more water, and hold it longer, and in those parts of the state where neither a deed nor a mortgage will hold real-estate, it will help to prevent the sand from drifting. People who have too much sand should sit up and take notice.

I have stated that in feeding the entire crop to stock and returning their excrements to the soil, the farmer is returning to the soil 95 per cent of what the crop took from it. I wish now to call your attention to a method by which the farmer may not only supply the missing 5 per cent of fertility, but in addition to this may materially increase the fertility of the soil.

I want to talk about the fertilizing value of clover. I would talk about alfalfa, for that is as good, if not better for fertility than clover. But you might as well try to make the average man love his mother-in-law as to try to persuade him to plow up a good stand of alfalfa.

There are few places in Nebraska where clover may not be grown successfully, and it is difficult for me to understand why more of it is not grown. Perhaps the fact is due to the high price of seed. Perhaps it is also due to the farmers lacking the knowledge of what clover may do for the soil, or what financial benefits are to be gained from growing it. Let me tell you a story, the experience of a man with whom I am well acquainted, of the use of clover as a fertilizer. This man's farm stands practically on edge. Through the center of the farm runs a small stream, and on either side of the hills rise abruptly and the line fence is near the top of the hill. The great problem of this farmer has been to prevent washing. It is an old, worn-out farm. The farmer could conmake sufficient barnyard manure to supply all its needs, and there was a strip of a few acres on the brow of one of the hills that sadly needed fertilizing. It is this red, yellow, barren kind of dirt that makes a man mad just to look at it.

Clover seed was worth $8 a bushel, and he figured it out that if he put fifteen pounds to the acre it would cost him $2 an acre to fertilize it with clover. It seemed a good deal of an expense, and the experiment seemed hazardous, but at last he made up his mind to try it, and he seeded it to clover, with oats as a nurse crop. His only thought was to fertilize the soil, and he had no thought and no hope of getting any money return from the clover. The next year he cut one ton of clover hay to the acre from the piece, and this was worth $6 a ton. He cut the second growth for seed. It was a good year for clover seed, and he got three bushels of clover seed to the acre, which he sold, on the farm, at eight dollars a bushel, thus making him a cash return of thirty dollars to the acre, where he had not expected a cent, and that beats anything in Nebraska except alfalfa. He was so pleased with this experiment, that the next year he seeded another piece to clover. The following season he cut one ton of clover hay to the acre, and this, that year, was worth $8 a ton. It was a poor year for clover seed, and in his second crop he got only two bushels of seed to the acre. This he sold for $10 a bushel, making him a cash return for his second seeding of clover, of $28 to the acre, which beats anything in Nebraska except alfalfa. What he did, any farmer in Nebraska may do. Clover is one of the most profitable crops that you can grow from a money standpoint, and it increases the fertility of the soil. This farmer put a plow into that red, yellow dirt and turned over the clover sod, and was surprised to find that it was not read or yellow any more, it was black. He had added to the fertility of the soil, I will not undertake to say how much. From this any farmer may see that by feeding his crop upon the land and returning to the soil the part of the crop that the animal does not use, and then following with a crop of clover, and continuing this system all about his farm, he may increase the productiveness and the fertility of the farm at the same time. More than this, by shipping to the market the finished product, instead of the raw food-stuffs, he would save, on an average, 10 per cent in freight. Any industry will flourish in Nebraska when assured of a 10 per cent profit.

And now just a word about weeds. Weeds are the savages of the soil. They exhaust its fertility, they drain it of its moisture. Our domestic grains have been improved from what they were originally in the wild state, and in proportion as we have improved them, we have weakened their power to resist. I imagine that the original corn which had a husk for each kernel, might perhaps have been able to hold its own with cockleburs and sunflowers. But as we have refined it, we have robbed it of its aggressiveness, and so with all our other cereals that have been improved from a wild state, until it has become as necessary to protect them from weeds as it would be to protect a Boston theological student from a gang of cowboys. We must get rid of our weeds if we are to save our soil. The first requisite to getting rid of them is to stop sowing them. I know you think you do not sow weed seed, but every farmer who sows grain just as it comes from the threshing machine, sows weed seed. If you do not believe it, buy a good fanning mill, and find out for yourself. I know a man who said that it was nonsense,—"Yes, sir, oats as they come from the machine are clean," but when the test of the fanning milling was put to them, a two bushel sack of oats yielded two-thirds of a milk pan full of weed seed which the farmer was sowing. The first requisite, then, is a good fanning mill. Never sow any small grain until it has been thoroughly freed from weed seed. After the weed seed has been taken out, put your seed through the mill again, blowing it as hard as you can, so as to blow out all the light grain, and plant only the heaviest and plumpest. It is good sense to select the heaviest and best corn for seed. Is it not equally as good sense to select the heaviest and best oats or barley for seed? When the crop has been removed from the soil, the stubble will grow up to weeds from the seed that is already in the soil. Watch them, and as they come into blossom, go over the stubble with a mowing machine, running close to the ground, and that will fix the weeds for that season. I would say plow them under, or disc them under, if I could be certain that every farmer would do it thoroughly, and do it at the right time, but a mowing machine is certain, and so I recommend the mowing machine. Follow this plan all about the farm, treating every field upon the farm in the same way, and you will get rid of most of your weeds. Of course there will be bad years, wet years when weeds will seem to come spontaneously, but with ordinary care and comparatively no expense you may free yourselves from this drain upon the fertility of the soil.

All I have said with reference to conserving and increasing the fertility of the soil has been based upon the notion that the farmer, by so doing, would make more money for himself from the soil. I have appealed simply and solely to his selfish needs, his acquisitiveness, to bring this about. But there are other and higher considerations which I wish to bring to your mind. A recent sociological writer has said that the prime object of life should be so to live that the next generation may be better than its immediate predecessor, better equipped, with greater powers, keener insight, better advantages. I should like you to take this view of it too. A neighbor of mine, to whom I had often talked upon this question of soil regeneration, met me upon the street one morning and said, "Professor, I have made up my mind that I will not leave worn-out land to my children." I wish every one of you would take the same high resolve. No man lives to himself alone, each man owes a duty to the future, to succeeding generations, to his children, and to his children's children. Each man owes a duty to his country, and that duty has relation, not only to the present, but to the future. This is a consideration that should appeal to every patriot, every man who loves his country.

I sometimes dream of a time, which my eyes shall never see, when this country will be as thickly populated as the countries of the old world.

Every one of its inhabitants will have to be fed and clothed, and the food and the clothing will have to come from the soil. And I sometimes ask myself how the nation will be able to support such an enormous burden with an impoverished soil. And it is because I love my country, and because I love this, my adopted state, and because the future of both is inexpressibly dear to me, that I make this appeal to you to give to your matchless—your incomparable soil, a fair chance to show what it can do.

SOIL TILLAGE.

BY ALVIN KEYSER.

We hear a good deal now about soil tillage. Our land is worth more now than formerly. It must produce more to pay interest on the increased value. Tillage, more tillage and better tillage will help to do it. Any tillage operation which will not directly or indirectly help to increase production or profit had better be left undone.

Tillage commences with the preparation of the seed-bed and includes all the operations of plowing, disking, harrowing and cultivating up to the time the crop is matured and ready for the harvest. When the virgin prairie with its fertility, stored up thru the ages, full of humus and organic matter, was first broken up only a small amount of work was necessary in the preparation of a seed-bed. Long cultivation has altered this condition. With the decay of organic matter and the loss of humus the soil compacts more readily than formerly. The large store of virgin, available food materials has been removed by crops or washed away by rains. One of the tillage problems of the present is how to incorporate organic matter again to form humus by its decay, and thus render available sufficient quantities of food materials to produce abundant crops.

Every stock-raiser knows that the pig, calf or colt, which is stunted at the start by insufficient food or poor shelter usually remains a runt the rest of its days. Plants, as animals, altho they develop in a somewhat different day, behave in the same manner. The crop stunted at the beginning usually remains a runt crop to the end of its days. And a runt harvest is garnered instead of a full grown, healthy normal harvest that results from a properly started, properly maintained crop. Plants thrive when the soil environment is congenial, as animals thrive when their environment is favorable. Plants love a deep, mellow, well fined, compact seed bed. Such a seed bed cannot be obtained by leaving the land bare and untouched in the spring until seeding time. The freezes and thaws of winter have loosened and mellowed the soil, put it in excellent tilth. This tilth and the proper amount of moisture can be maintained by early surface tillage or plowing. If the soil is allowed to bake, it loses its life and tilth and frequently these cannot be restored until another winter has brought its mellowing frosts. Early and timely tillage keep the soil in its mellow condition, thus preserving the tilth and keeping the soil moisture from being dissipated into the air.

Perhaps one of the most important things accomplished by tillage is the saving of soil moisture. It may seem like folly to argue conservation of soil water in a spring like 1908 when everyone is praying for the rain to let up. But the rain will cease after a while, it always does, and then the soil compacted by the rainfall will begin to lose water rapidly. The loss will proceed more rapidly because the conditions are right. If the surface is not tilled the soil will soon be drier than if no rains had come. The amount of water a common soil may hold and the amount required by growing crops is not usually comprehended. One inch of water over an acre amounts to over 862.2 barrels. The normal rainfall in eastern Nebraska is over 30 inches annually, while in the extreme western part of the state the average is under 18 inches. Thus, with a rainfall of 30 inches, each acre would receive 25,866 barrels of water. Each foot in depth of the average soil is capable of holding about four inches of water, equal to nearly 3,449 barrels per acre. Sandy soils would hold somewhat less, clay soils somewhat more. Thus the soil to the depth of six feet will hold about 24 inches of rainfall, equal to 20,699 barrels per acre. If we had a tank large enough to hold this water it would be 100 feet high and almost 30 feet in diameter. Thus it is apparent that the soil is an immense reservoir. Usually about two-thirds of the annual rainfall comes during the growing period. Fifteen inches of water well conserved so that the crop can make use of it, will produce a thirty-bushel crop of wheat or fifty-bushel crop of corn. But a compact moist soil with an unprotected, uncultivated surface may lose an inch of water in twenty-four hours. If drying winds are blowing, the evaporation may even exceed this amount. If the soil surface is protected by a mulch of loose, dry soil, produced by tillage, an inch of water might require ten or more days for its evaporation from the soil. The water thus saved will go far toward making a crop.

Arnold Martin, the twenty-acre farmer of Pawnee county, reports that it 1903 he followed two kinds of cultivation on adjoining plats of corn. On one cultivation was stopped July 3, the other was tilled once a week with a one horse, fine shovel cultivator until August 6. During this period of four weeks no rain fell. The drouth was broken August 6. The uncultivated corn turned yellow and showed plainly the effects of drouth. A crust formed on the surface of the soil, deep cracks appeared from which moisture escaped which should have gone into the corn crop. Half of the uncultivated plat was irrigated and the irrigation was repeated as frequently as the surface dried. The results are more expressive than language. The corn cultivated continuously until August 6 made ninety-two bushels of corn per acre, the irrigated plat made sixty-three bushels, and the plat neither irrigated nor cultivated after July 3 made twenty-six bushels per acre. Farmers in many parts of the state have had similar good results from good tillage.

The incorporation of a large amount of humus with the soil increases its water holding capacity. One hundred pounds of sand will hold from 20 to 25 pounds of water; 100 pounds of clay will hold from 50 to 60 pounds of water, while 100 pounds of humus will hold about 145 pounds of water. A soil well stocked with humus acts alive under the plow, while a soil which has been long under cultivation without manure or rotation acts dead. The difference is largely a difference in humus. Green manures, plowing under a green crop, will restore humus. Restoring humus has a value entirely separate from adding fertility which has been removed. That it has a fertilizer value is not questioned. But its tillage value rather than its fertilizer value is emphasized here, its power to mellow land and bring it into good "heart."

Tillage assists in rendering the materials of plant food available. The chemical changes produced in the soil, the bacteria which assist in preparing food materials require air for their best action. When the corn turns yellow in the wet spring, one of the results of insufficient aeration is shown. The air is shut out of the soil by water. Nitrification can not take place. The corn turns yellow because it is starving for nitrogen. Aeration is most likely to be insufficient in the spring, consequently tillage should be deeper and more frequent early in the growing season, and may be, under ordinary conditions decreased in depth and frequency as the season progresses. In all tillage aside from preparing the seed it must be remembered that the tilled or stirred soil is at the surface where food materials are elaborated most rapidly and is the richest on the farm. If tillage stirs this layer deeper than is necessary to conserve water and elaborate food materials, there is just that much removed from the feeding area of the crop roots where food materials are most abundant. Till enough but not too much is just as good a maxim as "Eat enough, but not too much." Cultivation is expensive, but up to a certain undetermined point it pays.

Soil texture may be improved or ruined by tillage. Heavy loam lands cannot be plowed wet without injuring texture. Soil crumbs are broken down and the particles run together, puddled. Lumps and clods result which frequently resist all efforts to subdue them until the frosts of winter slake them down. Soil under cultivation tends to become more compact except in the drier climates of the subhumid and semiarid regions. When our prairie sod was first broken the soil was crumbly and mellow enough. In this condition the soil will hold more water, rain penetrates it more readily. The field, in corn for the past 20 years, has lost its mellowness, that nice crumbly condition has disappeared. The compact soil permits the rain to penetrate very slowly. The field washes badly and the richest soil gets away. Over in the clover or alfalfa field the soil is again mellow. Nature's way of making a soil mellow is to grow a crop and allow the dead remains of the crop to go back to the land. Man can take advantage of nature and make her do part of the tillage. To do this a rotation must be practiced in which meadows or pasture alternate with cultivated crops. The roots of the meadow or pasture crops stay in the ground, a portion of the crop is plowed under there to rot, to change into humus. The soil well charged with humus holds and conserves water better, washes less and cultivates easier. The organic matter and humus by its decay act upon the mineral elements of plant food making them more available to succeeding crops. This is not mere theory as many farmers in eastern Nebraska, who have broken up grass land, clover or alfalfa and put into other crops, have found. A Gage county farmer reports ninety bushels of corn on clover sod as compared with thirty-seven bushels per acre on old corn ground. Both crops were grown in the same field on the same farm by the same man. Part of the increased yield is surely due to the food materials added, but not all. It is uniformly noticed that for a few years land which was in clover or alfalfa washes less than old grain fields, that the tilth is better and cultivation can be done for less cost. That tillage which makes use of nature instead of fighting her is usually most successful and profitable.

Perhaps there are no tillage operations so important or which will return larger dividends than that tillage given before the crop is seeded. With small grain and with the pasture and meadow crops the greater part of the tillage must be given prior to seeding owing to the nature of the crop. The experiment station has shown and advocated for some time the advisability of early fall plowing for winter grain and early spring tillage for spring grains. It is common practice in Nebraska to sow wheat after oats or wheat. Following the lessons shown so plainly, farmers in general try to plow in July, harrowing after the plow to preserve tilth and conserve moisture. This is virtually a partial summer tillage. The adoption of the practice has been to increase the average yield per acre of winter wheat in Nebraska. If the practice were more generally and faithfully followed there is no reason why the average yield of winter wheat in Nebraska should not be at least one-half larger than at present. Early plowing and harrowing at once, preferably the same half day, not only maintains tilth, conserves moisture, but it also gives time for the elaboration of plant food materials. Good tillage has enabled the winter wheat region to be extended westward for a considerable distance. Further improvement in tillage methods, the adoption of summer tillage in some of its forms, its intelligent use will extend the tilled area still further into the semi-arid region. There was a time when it was said that tame grasses and clover could not be grown in Nebraska west of the Missouri river counties. Even alfalfa fell under the ban and people said it could not be grown because it was so hard and uncertain to start that it would prove unprofitable owing to the high cost of seed. The experiment station took up the problem and worked out the best time for seeding and how the seed bed had best be prepared. Many farmers learned the essential facts by hard and expensive experience. They learned that deep and thoro fitting some little time in advance of seeding was necessary for success. In the drier seasons and drier regions of the state, summer tillage almost absolutely assures success in getting a good stand of either alfalfa or the grasses or clovers. Summer tillage or partial summer tillage puts the land in good tilth, conserves the moisture already in the soil, makes the soil more receptive of rainfall and permits the elaboration of plant food materials. Some of these were well illustrated by a few observations made last summer, 1907, upon the Nebraska University Farm. It was desired to fall seed to alfalfa a piece of land growing an oat crop. The land was double disked the same week of the harvest and plowed in July, harrowing the same half day as plowed. Copious rains fell during the harvest, but no more rain fell until August 28. Between that date and September 3, 3 inches of rain fell. Moisture determinations were made September 4 on this field and others. The rain was found to have penetrated four to six inches in pasture sod a few rods distance; six to eight inches in wheat stubble, separated from the oat land by a twenty-foot alley; eight inches in a corn-field across an alley on the other side; on a nearby piece of land, plowed when dry, the penetration was four inches, while in the oat stubble which had been tilled early the rain penetrated until the moisture from above met the moisture from below. And the soil was found to be thoroly moist down to a depth of six feet. Another field treated similarly, but on another part of the farm gave the same result. Alfalfa was seeded on the oat land the middle of August and altho no rain had fallen since early in July a perfect stand was obtained.

Tillage is the simplest and cheapest means at hand for increasing production. It should be looked to first on this account. When all that may be accomplished by tillage has been done, we should look further and study the problems of fertility of manuring and rotations.

DISEASES OF POSTS AND TIES.

BY A. G. HAMEL, OMAHA, NEB.

To make a comprehensive report on this subject would involve the discussion of a large portion of what are known as "fungi." In order to make a brief report I will deal with just a few of the principal diseases.

Polyporus vaporarius.

This is a rather common wound parasite in Europe. When the spores find lodgement in the ties or posts they germinate and infect the wood with a snowy white mycelium and red or brown streaking of the substance, in lines radiating from the crack in which the spores germinated. This is very damaging to ties, especally if they have not been seasoned.

Polyporus ponderosus.

A common disease affecting the Bull Pine. It is a large *Polyporus* of the *Fomes* type, usually growing singly, sometimes two or three together. The top is covered, after the first year, with a hard, brittle, dull substance, which cracks as it grows old, and looks sandy or crystalline. It does not do much damage if the wood is kept in a dry condition.

There are about six or eight of the fungi known popularly as toadstools, technically as *Hymenomycetes*, which do a great deal of damage to posts and ties. According to Hartig, these timber-destroying fungi can be detected from the markings and discolorations they produce in the wood; those due to *Hydnum diversidens*, *Thelephora perdix*, *Polyporus sulphureus*, *Polyporus igniarius*, *Polyporus dryadeus*, and *Stereum hirsutum* being all different, and in some cases so characteristic that the merest glance suffices to diagnose the disease.

Polystictus versicolor.

This is a common pore fungus. The "shelves" are thin and leathery and conspicuously zoned above. The zones are of different colors, varying from a light tan color to very dark brown or black, and are frequently velvety in appearance. The pores are on the under surface and are very small. Whenever this fungus has attacked a tie it is a good indication that it is in a rapid state of decay. It is usually a saprophyte, although it lives on the heartwood of the Catalpa as a parasite.

Lenzites abietina.

This is one of the exceedingly common timber rots of soft woods. The fruiting body is either a flat prostrate one or may become a low shelf. It is seldom large and does not usually exceed a few inches in diameter. The exposed surface is covered with gills which often radiate from the center in the prostrate forms. The fruiting bodies are tough, leathery to woody and dark-yellow to reddish-brown in color. The top of the cap is somewhat hairy when young, becoming more or less smooth when old. The gills are rather thick.

Lentinus lepideus.

A very familiar gill fungus which inhabits almost all kinds of soft needle leaved tree timbers. It is, as far as is known at present, a saprophyte. The fruiting body is a stalked form with a central stem and is very tough and fleshy. The cap is two to three inches or more across and is at first pale yellow. Later black scales develop on the upper surface. The flesh of the cap is white. The gills are slightly wavy, running down the stem for a short distance and the margins are irregularly toothed, a character which distinguishes this fungus and its close relatives from the other gill fungi. The gills are white, tinged with yellow. The stem is one inch or more in length and usually tapers toward the base, is hard, pale in color and has scales similar to those of the cap. The fruiting bodies grow in clusters.

Merulius lacrymans.

This fungus is one of the most destructive of timber rots, both on account of its action and its frequent occurrence. When the mycelium has permeated a wood tissue it leaves the latter as a spongy mass of brownish material. When this decayed portion becomes dry it shrinks, causing cracks which form at right angles to each other, commonly forming squares.

The fruiting bodies are flat and prostrate and never form "shelves." At first they are white, then reddish and later turn dark yellow brown on account of the numerous spores produced on the surface. The fruiting bodies are often five or six inches in diameter.

Agaricus melleus.

This is the "shoe-string fungus" rot, one of the common fall mushrooms. They are usually found in dense clusters, the lower of which are covered with the fallen spore-powder from the upper fruiting bodies. The whole fruiting body, except the gills, is more or less honey colored. The mushroom cap is lined on the under surface with plates or gills which radiate out from the stem and bear the spores. These are white and may often be found covering sticks and leaves under the fruiting bodies. The honey-colored upper surface of the latter is covered with fine, fibrillar scales of a dark color. These scales may also be found on the young stem. When old the whole fruiting body may become entirely smooth.

The reason that this fungus bears such a name is because of the shoestring like strands of the mycelium from which the fruiting bodies originate. It is this mycelium which lives saprophytically upon props, etc. It does great damage to mining props.

Though almost all ties and posts are easily affected by disease, there are conditions which are necessary for the growth and development of wood-destroying fungi. There are at least four conditions in which the tie or post must be in before it can become affected: (1) Presence of water; (2) air; (3) organic food material, and (4) a certain amount of heat.

The wood fibers and the organic substances found in the living cells of the sapwood, such as albuminous substances, starch, sugar, and oils form the food supply necessary to start the growth of the fungus threads. A further requirement is oxygen, and no growth will take place under water or in the ground at depths of two feet or more, the depth varying with the character of the soil. The best examples of this necessity for oxygen can be found in the way in which fence posts and telegraph and telephone poles decay at points just at or just below the surface of the ground, where there is a balance between the supply of air and of water.

In order to reduce the danger from the attacks of fungi and other dangers, much of the timber is seasoned. Seasoning is ordinarily understood to mean drying. Seasoning implies other changes besides the evaporation of water. One of the differences between seasoned and unseasoned wood, it is thought, consists in changes in the albuminous substances in the wood fiber, and possibly also in tannins, resins, and other incrusting substances. Seasoned wood fiber is very much more permeable, both for liquids and gases, than the living unseasoned fiber. The drying out may result in considerable shrinkage, which may make the wood fiber more porous. It is also possible that there are oxidizing influences at work within these substances, which result in their disintegration.

There are many advantages of seasoned wood over unseasoned, a few of which I will relate. Season timber lasts much longer than unseasoned timber. Seasoned timber has less percentage of water in it, thereby the danger of attack from fungi is lessened. The seasoned timber is treated much more easily and seasoning after treatment prevents the rapid leaching out of salts introduced to preserve the timber.

After the wood is seasoned, the treatment falls into several classes, according to the manner in which the preservative is applied.

The treatment often depends upon the amount of wood to be treated When there are but few pieces, the preservative is often applied to the outside of the wood, either with a brush or by dipping it into the preservative. In the case of posts, they are merely dipped into the tank or else the preservative is applied with a brush. It is often only necessary to treat the post at the point where it is near the surface of the ground. In the case of ties, they are either dipped into the preservative or else it is forced into the ties by pressure. It is for this reason that ties are well seasoned before treating.

The following substances have been used with considerable success in the treatment of posts and ties:

Creosote.—May be forced into the timber by pressure or the timber might just be dipped into the creosote.

Zinc chlorid.—This is the cheapest process and is used quite widely. The only trouble with it is that it leaches out of the wood very quickly.

Zinc chlorid and tar oil.—The treatment of porous timber with zinc chlorid, followed by a treatment of three pounds of tar oil, is recommended as a process which will give good results.

Spiritine.—Consists merely in the immersing of the ties in this substance for twenty-four hours or longer as is necessary.

Beaumont oil.—The ties are soaked in this liquid for twenty-four hours or longer.

Zinc-tannin.—This consists in three different processes or treatments: (1) Clear chloride of zinc, 4 per cent strong; (2) a solution of glue, 2 per cent strong; (3) a solution of tannin, 2 per cent strong; each treatment taking about twelve hours.

Fence posts, when preserved, are charred or treated when absolutely dry with such substances as carbolineum, spiritine, or tar oil. They can also be soaked in corrosive sublimate, or hot tar may be applied to them.

DISEASES OF FIVE COMMON PLANTS.

BY A. H. MILLER, KENNARD, NEB.

A plant is said to be diseased when it shows any deviation from the ordinary or average condition or behavior, relative to appearance, growth, color of bark or foliage, fruitfulness, time of dropping leaves, or length of life. The cause of the disease may be attributed, ordinarily, either to a fungus, to a parasitic-filamentous plant, or to an insect; however, the pathological condition is not always due to these alone, but to the unfavorable habitat in which the plant lives. Highly cultivated plants, such as the apple beet, corn, grape, and potato, the diseases of which will be discussed in this paper, have been brought so far from their original conditions, and developed so finely that they can no longer withstand the attacks of their enemies with their former sturdiness, and must come under the protection of the horticulturist or agriculturist.

DISEASES COMMON TO THE APPLE.

(1) Brown Rot (*Monilia fructigena*) usually appears in the spring on the leaves as thin, velvety, olive-brown patches. When the spores of the attacking fungus are matured they are scattered by the wind, birds, or rain, and fall upon new leaves or young fruit. On the fruit the first appearance of the disease is indicated by brownish scattered patches on the skin; soon small tufts composed of spores appear. These tufts are usually arranged in irregular circles around a central starting point as the disease extends. Fruit attacked does not rot but lies in a mummified condition.

(2) Apple Scab (*Fusicladium dendriticum*) attacks both the leaves and the fruit in an injurious manner. The disease appears first on the leaves under the form of small, roundish, dark spots mostly on the upper surface. These patches increase in size and run into each other, forming large, irregular-shaped, blackish blotches; frequently the leaves are killed. On the fruit the fungus appears as a brownish scaly mass and checks the growth of the fruit in that particular spot. The apple in this stunted and distorted condition is unfit for market.

(3) Bitter Rot or Anthracnose (*Gloeosporium frutigenum*) attacks the fruit and affects it for both eating and keeping purposes. The disease appears first as spots, later it develops into dark brown, sunken patches of various sizes. To the taste the apple affected is very bitter.

DISEASES COMMON TO THE BEET.

(1) Leaf Spot (*Cercospora beticola*) is not especially harmful except that the leaf surface is reduced, which means that the percentage of the

sugar in the root is reduced. The disease is characterized by irregular, dry, pallid blotches on the leaves.

(2) Scab (*Oospora scabies*) on the beet resembles the potato scab, and appears on the root as roughened, corky patches, rather dark in color. When first dug up a grayish, delicate mould is present on the patches, but this soon disappears. As a rule the disease does not materially affect the vitality of the plant, but gives the root an unwholesome appearance.

DISEASES COMMON TO CORN.

(1) Smut (*Ustilago zeae*) is one of the most common and widespread diseases that the farmers are compelled to combat. Scarcely a field is free from its attack, sweet corn being more subject to the attack of the fungus than common field corn, because of its tenderness. Spores of the fungus fall upon some part of the plant, on either the young ear, tassel or stem, and germinate, forming, as growth continues, large, grayish, soft, watery masses. In the fall when the corn matures, these masses turn to a dark color and when entirely dry the outer cover bursts, liberating a quantity of dark brown or blackish spores.

(2) Mould (*Fusarium*) is characterized by its grayish color and peculiar odor. The fungus attacks the corn either while it is yet in the field or after it is in the crib, moisture being a prime requisite for its development. Corn affected by the disease, while not dangerous to stock, has no sale on the market.

DISEASES COMMON TO THE GRAPE.

(1) Anthracnose (*Sphaceloma ampelium*) is a prevalent disease on the fruit. When the fruit is nearly grown the fungus appears as white spots; as it ripens it has the appearance of having been seared by a hot iron. The chief damage is the reduction in size and appearance for market; the taste, however, is not affected.

(2) Black Rot (*Guignardia bidwellii*) is one of the most destructive and widespread diseases with which the viticulturists in the United States have to cope. As a rule, the fungus attacks the young shoots and leaves first, the disease appearing under the form of small brownish patches. A little later the small blackish or brownish spots appear at different points on the surface of the fruit, which very soon becomes black, shriveled and hard, but as a rule does not drop off.

(3) Grape mildew (*Plasmopara viticola*) attacks the foliage, young shoots, tendrils, flowers and young fruit of the vine. The disease usually appears first on the upper surface of the leaves in the form of pale greenish or yellowish spots. These spots increase in number and size, and change to a brown color as the tissue dies; finally the leaf becomes brittle and falls off. Even if the fruit is not attacked, the falling off of the foliage prevents its proper development.

DISEASES COMMON TO THE POTATO.

(1) Scab (*Oospora scabies*) of the potato is the same as the scab of the beet. The damage to the potato is practically the same also.

(2) Late Blight (*Phytophthora infestans*) has in the past been one of the most destructive diseases to the potato. The earliest indications of the disease are the appearance of small brownish blotches on the leaves; these increase in size, followed by the curling of the leaf. In exceptional cases the leaves blacken and decay in a few days and emit a disagreeable odor. Fortunately this blight has not yet appeared in Nebraska, although it is common from the Mississippi river eastward to the Atlantic ocean.

REPORT OF THE ENTOMOLOGIST

REPORT OF THE ENTOMOLOGIST

FOR THE BIENNIUM ENDING MARCH 31, 1908.

To the Secretary of the State Board of Agriculture.

SIR: Herewith I have the honor to present for publication a brief report on the most destructive insect pests of farm crops and domestic animals as they occurred during the biennium ending March last. The work upon which this account is based was carried on mostly by Messrs. Myron H. Swenk and Harry S. Smith, two men trained in the Department of Entomology in the University of Nebraska. They have also prepared the accompanying report on the insects investigated.

Hereafter it is the intention to issue an annual report in addition to frequent circulars dealing with the various pests as they appear. Trusting that this report will be of aid to farmers and stock growers of the state, I remain,

LAWRENCE BRUNER,
State Entomologist.

THE PRINCIPAL INSECTS INJURIOUS TO AGRICULTURE DURING 1906–07.

BY MYRON H. SWENK,
Assistant in Insect Pest and Plant Disease Bureau.

In the following pages mention has been made of the principal insect enemies, other than the aphids or plant-lice, which have proved especially injurious to cereals, forage crops and vegetables in Nebraska during the two years between April 1st, 1906, and April 1st, 1908. The aphids form the subject of a separate paper which will be found immediately succeeding this one. The period of time covered by this report was unaccompanied by any unusually severe insect depredations, yet the number of forms which were actively injurious is large, and the aggregate results of their work has meant a very heavy loss to the farmers of the state. The brief discussions of life histories and remedies which accompany the mention of many of the forms are inserted in the hope that more complete knewledge of these points will materially lessen the destructiveness of these insect pests in the years to come.

THE CHINCH-BUG (*Blissus leucopterus* Say).

During the period here considered there have been strong indications of a revival of chinch-bug activities in several of our counties along the southern border of the state. Following the outbreak in 1900, which continued during the next year and died out in 1902, the succession of wet years so reduced the numbers of this pest that no reports of considerable damage were received for the next three years. But about the third week in June of 1906 reports of damage by chinch-bugs came in from southern Webster and Franklin counties, and sporadic complaints and requests for inoculated bugs were received until early in September. The damage during 1906 was very small and mostly on corn. Early in July of 1907 reports were again received from the same counties indicating more severe damage than in the preceding year, and these were soon followed by complaints from the adjacent counties of Nuckolls and Thayer. The bugs were working in oats and wheat and going into the corn, and in several localities the damage was considerable. This spring (1908) reports were received as early as April 22 from Furnas county, and within a week were followed by complaints of severe injury to wheat in Frontier, Webster and Nuckolls counties. Whether or not the threatened outbreak materializes depends upon the character of the season of 1908; if the summer is continuously wet the bugs will probably be checked, but if a season of drought or intermittent rainfall prevails a rather severe attack may be expected.

The chinch-bug, as is well known, is an old offender. Away back in 1864 it was injurious through the whole Mississippi valley, and was estimated to have destroyed three-fourths of the wheat and one-half of the corn over most of this area, a loss estimated at from seventy-three to one hundred millions of dollars.[1] In 1871 it was again the author of wide-spread injury, and was estimated by Dr. Le Baron to have damaged the crops of Iowa, Missouri, Illinois, Kansas, Nebraska, Wisconsin and Indiana to the extent of thirty millions of dollars.[2] In 1874 it was as injurious to the nation as a whole as in 1864, and in Nebraska alone was declared to have caused a loss of $750,000.[3] Again in 1883 it began to increase and during the dry years of 1885 and 1886 it was the cause of much loss,[4] while its ever-growing abundance led up to the great destruction of crops all over the Mississippi valley in the next year, when the experience of 1874 was almost duplicated.[5] During 1888 it was still present over the entire state in harmful numbers. In 1892 it began to increase in the southern counties, and in the fall of 1893 again became abundant, while in 1894 and the next two years it was very destructive over most of southern Nebraska, and during these three years fungus was sent out by the Experiment Station to assist in the control of the insect.[6] The most recent outbreak was in 1900 and 1901 when fungus was again sent out by the State Entomologist in response to the demand from farmers over the state. With these past experiences in mind it is but natural that we should watch with genuine concern any indications of an increase in numbers of this formidable foe.

The whole of the United States east of the Rocky Mountains, except the tip of the Floridan penninsula, is occupied by this insect, which gains its livelihood by sucking the sap from cultivated corn, wheat, oats, barley, rye, timothy, sorghum, millet, rice and broom corn, as well as from a number of native grasses which probably formed its original food plants. There are two broods annually in this state. The bugs hibernate as adults among the roots of grass tufts and beneath piles of leaves or rubbish along hedgerows and edges of wooded tracts, or in similar protected nooks. They remain torpid during the cold weather, but with the arrival of the warm days of spring they crawl forth from their winter quarters and begin flying about, mating and searching for a suitable locality in which to deposit their eggs. This flight usually occurs late in April or early in May, and wheat fields are usually selected for the deposition of the eggs. They are placed among the roots of the chosen plants, just below the surface of the ground or about the base of the plant at the ground level. Each female lays 300 to 500 eggs, consuming three to six weeks in the process. This ovipositing by the first brood occurs during May and June, and as the eggs hatch in twelve to twenty-two days we may find bugs of all sizes from newly hatched to nearly full grown by harvest time, all belonging to the same brood. It requires about sixty days from the time the egg is laid until the bug is full grown, and during this process the insect molts four times.

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[1] Shimer, Proceedings of the Academy of Natural Sciences of Philadelphia, xix, pp. 75-80 (1867), and Walsh and Riley, American Entomologist, i, p. 197 (1869).

[2] Second Report State Entomologist of Illinois, p. 144 (1872).

[3] McMillan, Bulletin of the Nebraska Agricultural Experiment Station, No. 2, p. 11 (1888).

[4] Bruner, Bulletin No. 13, Division of Entomology, pp. 35-36 (1887).

[5] Dodge, Bulletin No. 17, Division of Entomolgy, pp. 7-8 (1888).

[6] Bruner and Barber, Bulletin of the Nebraska Agricultural Experiment Station, No. 34 (1894).

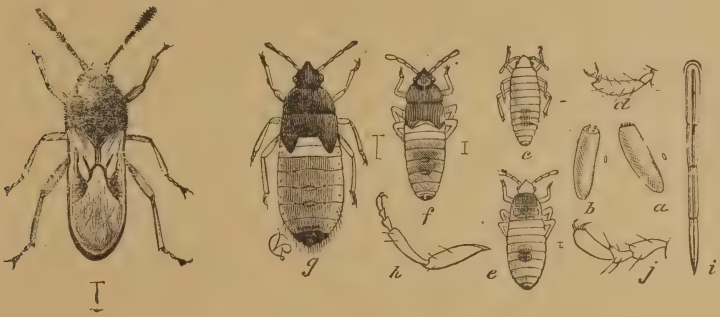

Fig. 1. The Chinch-bug: adult; *a*, *b*, eggs; *c*, newly hatched larva with enlarged tarsus at *d*; *e*, larva after first molt; *f*, larva after second molt; *g*, pupa; *h*, *i*, *j*, leg, tarsus and beak of adult bug. [From Riley, 2d Missouri Report, p. 15, and 7th Missouri Report, p. 20.]

The bugs feed about the roots of their host plants,—full grown bugs, newly hatched larvae and all intermediate stages together,—until the small grain has ripened, when the are forced to migrate to prevent starvation. This migration is performed by crawling, and the corn, oats, millet, sorghum and broom corn are the new crops principally attacked. Here they remain until the great majority have become fully winged, when they fly off in search of new food plants for the second brood of bugs. This flight usually occurs late in July in this latitude. The food plants of this second brood are mostly various grasses, and but little harm is done by it except occasionally in very late planted corn. As soon as the individuals of this brood become winged, which development is reached by September, they fly about in search of suitable hibernating quarters, and having found them remain in hiding until the following year.

REMEDIES.

Chinch-bugs may be attacked while in their hibernating quarters by burning the accumulated rubbish along the roads, edges of fields, hedgerows, ravines and pastures in the winter or early spring when the bugs first begin to come out from their retreats. In springs following a year of injurious abundance, such a cleaning up will destroy millions of the bugs and prevent their starting the new brood. The eradication of Osage orange hedges would also prove to be of value by destroying one of their choicest and most inaccessible grounds. When the bugs are moving in vast numbers from the grain fields into the corn and millet, one or two deep furrows plowed across their path and the earth of the sides finely pulverized by a brush drag will effectually check them, and by dragging a heavy plank through these furrows they will be crushed, or they can be killed by sprinkling with kerosene emulsion. Even after they have enterd the corn they may be destroyed by the use of a spraying of kerosene emulsion, which will kill all the bugs clustered upon the corn. Such application should best be made in the early morning or toward evening, and should be diluted with fifteen parts of water. In wet weather when the sides of the furrows become firm, a line of coal tar three-fourths of an inch in width with postholes dug every 10 to 20 feet will check the bugs, as they will run along the barrier until they reach the holes, where the mass of struggling insects may easily be killed with kerosene. It is much better if the coal tar line be placed on a surface rendered hard and and smooth by dragging a plank over the ground. During years of excessive abundance and in the prevalence of warm wet weather the fungous diseases of the chinch-bug may be used with great effect, and if inoculated material is available it should be employed to the fullest extent.

THE FALSE CHINCH-BUG (*Nysius angustatus* Uhler).

This insect resembles the chinch-bug very closely, so much so that it is commonly mistaken for its more destructive relative and has thereby earned for itself the above name. It may be easily told from the genuine chinch-bug by its grayish rather than blackish color in the winged insect, and by its lack of the large black spots on the middle outer edges of the wings. The young are gray, streaked lengthwise with fine, dusky lines, very different from the reddish and dusky larvae or the plain, dusky pupae of the chinch-bug. Its habits are on the whole quite like those of the chinch-bug. It is two brooded, the first brood maturing in late May and the second in late July, and passes the winter in the adult stage.

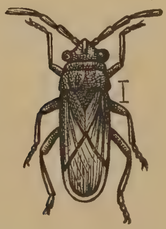

Fig. 2 The False Chinch-bug: adult. [From Riley, 5th Missiouri Report, p. 112.]

The cause of its mention in this connection is the fact that it was unusually abundant in northwestern Nebraska from Sheridan to Sioux county during June and early July, 1906, and did considerable damage to garden truck. It was particularly abundant in the vicinity of Gordon, and was also reported from Greely county. Cabbage, turnips, lettuce, beets and radishes are mostly attacked, but the potato and currant bushes are also harmed. The injury consists in sucking sap from the foliage which leaves small punctures surrounded by an area of dead tissue appearing as reddish specks. It feeds largely upon certain weeds, notably purslane and smart-weed, and the eradication of these weeds will assist in keeping it under control. If it becomes necessary to fight the bugs on the crops they may be collected in pans containing kerosene or killed by the use of kerosene emulsion diluted in fifteen parts of water.

Several other species of these bugs have similar habits and at times are also mistaken for the chinch-bug.

THE ARMY-WORM (*Heliophila unipuncta* Haworth).

The first recorded appearance of the army-worm as a destructive insect in this state was in the summer of 1888, when Professor Lawrence Bruner found it doing harm in extreme northwestern Nebraska and adjacent portions of South Dakota.[1] The following year several localities in northeastern Nebraska were infected in limited areas, and some injury was done in millet and oat fields.[2] During the next three years it was not injurious, but in 1893 it was exceedingly abundant, and did much injury in the northern and western counties as well as several eastern ones, notably Dixon and Jefferson.[3] Millet was mostly attacked, and to a less extent late oats and corn also. Dipterous parasites were abundant, however, and large flocks of birds were present in the infested regions, feeding on the worms, and together they succeeded in destroying three-fourths of the invaders, so that during the next two years there were no reports of injuries. In June of 1896 the army worm again appeared in considerable numbers in southeastern Nebraska, a fact which caused the publication of an article in the "State Journal" by Professor Bruner describing the habits of the insect and suggestions for its control. During the next ten years there were no important outbreaks.

Late in July of 1906 numerous reports were received at this office from western Thurston and northern Cuming counties of caterpillars working in great numbers in millet and oat fields, and beginning to migrate to corn. Some corn was reported as already ruined, the stalks being stripped of leaves. All the reports agreed that the worms were originally confined to a long, narrow strip of country which had been severely dealt with by a hail storm several days previous to the appearance of the worms. Professor Bruner visited the locality during the first week in August and found that the worms were destructive, but in a very limited area, chiefly in the region between the towns of Pender, Bancroft and Wisner. Enemies were present in abundance and the worms soon disappeared. Another small outbreak occurred near Caldwell in Scott's Bluff county early in September, the oat fields being principally attacked. No reports of army-worm damage were received during 1907.

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[1] Bruner, Bulletin No. 5, Nebraska Agricultural Experiment Station, p. 26 (1889).

[2] Bruner, Bulletin No. 22, Division of Entomology, p. 98 (1890).

[3] Bruner, Bulletin No. 32, Division of Entomology, pp. 14-15 (1894).

The army-worm is three-brooded annually, the three appearing in middle and late May, late June and early July and late August and early September, respectively. Hibernation is accomplished in both the caterpillar and moth stages. The eggs for the first brood are laid in May, and are deposited behind the sheath of some grass or grain stem in masses of a dozen to fifty or more, being glued to the stem by a sticky secretion. Six or seven hundred eggs are laid by each female moth. They hatch in eight to ten days, and the caterpillars reach full growth in twenty to thirty days. Pupation is accomplished by the caterpillars entering the ground for about an inch and there forming a cavity before transforming into chrysalids. In twelve to fifteen days the moths emerge and after about a week begin to deposit eggs for the next generation. The moths are chiefly nocturnal, remaining during the daytime in the dense vegetation or other concealed retreats, except on cool, cloudy days, when they sometimes venture out.

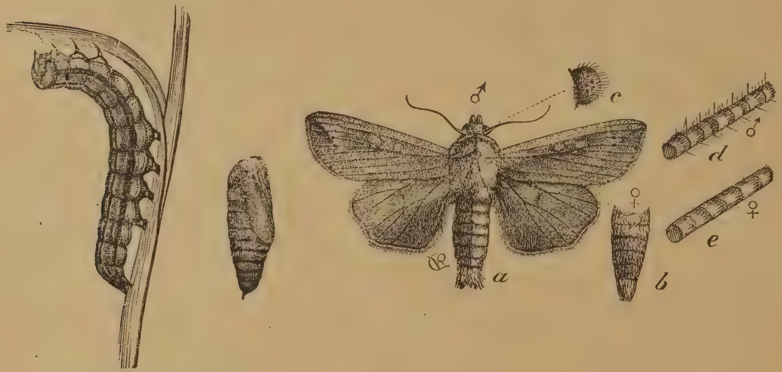

Fig. 3. The Army-worm: full grown caterpillar; chrysalis; *a*, male moth; *b*, abdomen of female moth; *c*, eye; *d*, *e*, bases of male and female antennae. [From Riley, 2d Missouri Report, p. 49, and 8th Missouri Report, p. 33.]

It must not be supposed that this insect is present only when moving in armies, for it may be found any year in rank grasslands living as a cut-worm. It is only when they increase so rapidly and enormously that their food supply is devoured before they have reached full growth that they resort to the habit of massing in armies and proceeding in a body to new foraging grounds, destroying everything green as they go. When on the march they devour any small grain, corn, blue-grass, timothy, millet, sorghum or flax as well as numerous garden vegetables and weeds, such as ragweed, amaranth and nightshade. In attacking corn they ascend the plant and devour the leaves first, later consuming the remainder of the plant if the number of worms is large. The caterpillar itself is a distinctly striped cut-worm about an inch and a half in length, the sides having two greenish yellow stripes enclosing a black one, and the back greenish black with a broken white median stripe. The moth to which it gives rise is yellowish brown with a distinct white spot in the center of each fore wing, and measures about an inch and a half in expanse of wings.

To stop an army of these worms when on the march deep furrows are plowed, and the side of the furrows away from the worms is made perpendicular by the use of a spade. Every fifteen feet post holes are dug in the bottom of the furrows. The caterpillars travel up and down the furrow seeking to pass on, until finally they lodge in a post-hole, where the accumulated worms may be killed with kerosene, exactly as in the furrow barrier used against migrating chinch-bugs. The burning of old grass and stubble in the spring will destroy many of these pests in all stages of development. But ordinarily the army-worm is kept well in check by its natural enemies, which include insect parasites, parasitic diseases and predaceous insects and vertebrates which devour them in enormous numbers.

CUT-WORMS (*Noctuidae*).

By the term "cut-worm," properly applied, we mean the larval stage of a certain family of nocturnal or owlet moths, these caterpillars agreeing in the characteristic of hiding during the day under clods or some similar object lying on the ground, or by burying themselves a little distance in the earth. They are stout, soft, smooth skinned, dull colored worms, variously striped or blotched, and when found in their retreats are usually

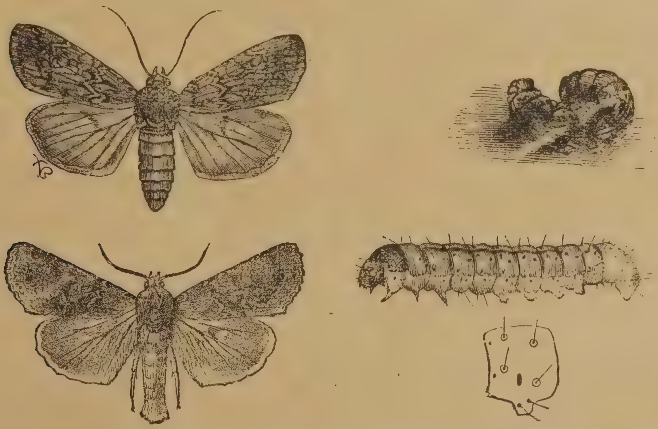

Fig. 4. The W-marked Cutworm (*Noctua clandestina*) and its moth, and the Glassy Cutworm (*Haydena devastatrix*) and its moth. [From Riley, 1st Missouri Report, pp. 79 and 83, etc.]

closely curled up into a circle. At night they come forth, and destroy vegetation by cutting the plant off close to the earth or buds from the trees and chewing at the stems, or by eating the leaves.

Reports of cutworm injury were received during 1906 and 1907 from numerous localities in eastern Nebraska. The attack was principally upon corn, wheat, alfalfa, potato and tomato plants. The different species of cutworms found in the state, and there are probably a hundred or more distinct kinds, have different habits and life-histories so that the remedies which might apply in dealing with one would not with another. As a rule, it may be said that most species hibernate as partially grown caterpillars and begin upon their various food-plants as soon as the latter start growth in the spring. They pupate in the ground, mostly in late June or early July, and later give rise to the moths, which lay their eggs in grass lands in time for the larvae to hatch and gain partial growth before winter begins. This applies to the single brooded species, but a few, like the army-worm, have two or three broods annually.

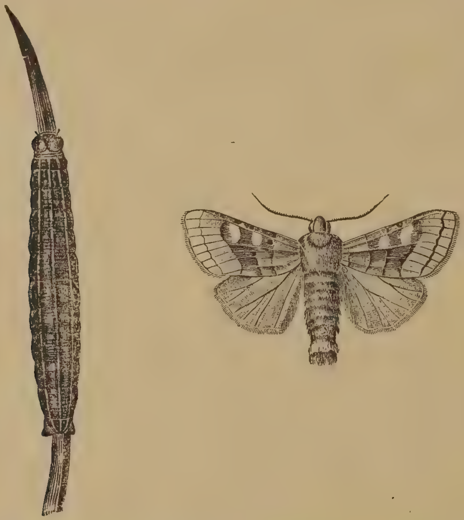

Fig. 5. The Bronze Cutworm (*Nephelodes minians*) and its moth. [From Lintner, 1st New York Report, pp. 100 and 106.]

In the garden it is advantageous to supply artificial hiding places, such as blocks of wood, under which the worms will hide during the night and may be found and killed the next day. When field crops are affected the best methods are preventive ones. When the moths have laid most of the eggs which are to produce the wintering brood of caterpillars, if the ground be plowed, these along with such caterpillars as have already hatched, will be buried so deeply that they cannot again reach the surface and so are killed. If corn is killed by cutworms, when there is time to do so, it is best to wait until the worms have reached their full growth and pupated before the crop is replanted, when there will be no danger of more injury. Occasionally, cutworms move from an over-run field to new territory in companies much like their relative, the army-worm, and may then be dealt with similarly.

CORN-ROOT WORMS *(Diabrotica longicornis* and *D. 12-punctata).*

There were reports of injury to young corn by root-worms in Otoe and Hamilton counties early in May, 1907. The northern corn-root worm (*longicornis*) has been known from this state for many years, and was first reported as becoming notably common in eastern Nebraska in 1889, and during subsequent years has spread considerably westward.[1] In 1891 it was quite destructive in eastern Nebraska, especially in the Elkhorn valley, and principally in regions where crop rotation was not practiced.[2] It has since been the author of considerable damage annually, and over the entire country injures the corn to the extent of millions of dollars each year. The southern corn-root worm (*12-punctata*), while it has been known for an equal period as an abundant insect in this state, has never proved so injurious to corn as the northern species, and is consequently of less economic importance.

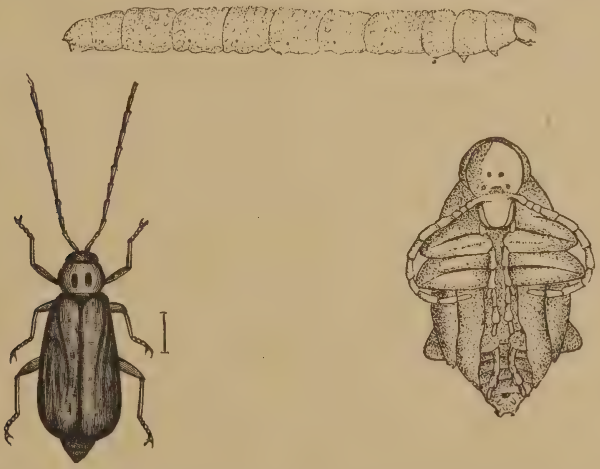

Fig. 6. The Northern Corn Root-worm: larva, pupa and adult beetle. [From Forbes, 18th Illinois Report, pl. xv, fig. 2, pl. xiv, fig. 8, and Bruner, Report Nebraska Board of Agriculture for 1888, p. 110.]

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[1] Bruner, Bulletin No. 22, Division of Entomology, p. 100.

[2] Bruner, Bulletin No. 26, Division of Entomology, pp. 9-10.

The northern corn-root worm is single brooded in Nebraska. In September and the first half of October the eggs are laid about the roots of the corn and remain there during the winter. In the spring these eggs hatch and the larvae attack the roots of the young corn, continuing to feed upon them during the early summer. The roots and stalk are penetrated by the larvae, which form minute longitudinal burrows near the surface of the roots and cause them to decay at the ends. These larvae are half an inch long, about as thick as a pin and white in color, and may be found within their burrows by splitting the affected roots. Late in June and early in July the first larvae mature and pupate, and toward the middle of July the beetles appear and continue emerging for a month or more. The beetles feed upon the soft parts of various plants, —corn, cucumber, squash, pumpkin, bean, clover, and various composites, such as sunflower, goldenrod and thistle, and for the most part die before winter.

The remedy for both of our corn-root worms is simply a rotation of crops. As the eggs are laid among the roots of the corn in the fall, if the field be planted to some other crop the next year the young larvae on hatching will find no food plant and starve, for in its larval stage the northern corn-root worm feeds only on corn, so far as is known.

WHITE GRUBS (*Lachnosterna* sp.).

Complaints of white grubs injuring blue-grass lawns were very frequent during both 1906 and 1907, and injury to corn and young alfalfa was also reported. The roots are devoured, which results in the weakening and final killing of the infested plants. One correspondent from Hartington, Cedar county, reported large patches of his lawn, one 12x75 feet, to be completely destroyed; another from Norfolk, Madison county, had two-thirds of his lawn destroyed; while from Fullerton, Nance county, two reports testified that most of the lawns in the town were badly affected and many ruined, one of the correspondents having found fifteen grubs under a square foot of sod in his lawn. This was in August and early September, 1906. During 1907 the grubs were even worse, especially in the larger cities, Omaha and Lincoln. From Boone and Otoe counties came reports of serious injury to corn, one farmer having lost one-half of his young plants.

White grubs are the larvae of the large, shining, dark brown or black beetles commonly known as "May-beetles" or sometimes as "June-bugs," which appear in such large numbers during the months referred to, and make themselves conspicuous by flying into lighted rooms and buzzing and bumping about confusedly. These beetles fly only at night, and then feed upon the foliage of many kinds of trees and bushes, often doing much harm by defoliating them. During the day they remain quiet. The females lay their eggs singly in the ground, and, after about two weeks they hatch and the grubs feed upon the tender grass roots until full grown. Two years are required for the grub to reach its full size, then during the third year it pupates and after a little over three weeks transforms into the adult beetle, which remains in the earth, however, through the winter and appears above ground the following spring.

These insects are the victims of many natural enemies, both as larvae and adult beetles. Birds, mammals, predaceous insects, parasitic flies and wasps and fungous diseases all attack them severely, still they manage to multiply unduly and menace our crops and lawns. For grubs in corn and small grain the avoidance of evidently infested grasslands for the new crop, rotation with a comparatively immune crop such as clover, and, whenever it is possible, a fall plowing to expose the grubs and beetles to their natural enemies and the elements is advised. For grubs in lawns no satisfactory remedy is known, but something can be gained if the beetles are working upon the trees near the lawn by jarring them into some collecting receptacle during the cooler part of the night and destroying them before their eggs are laid.

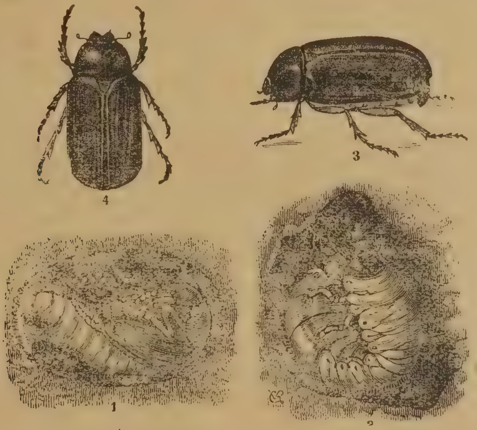

Fig. 7. The Common White Grub (*Lachnosterna fusca*): 1, pupa; 2, larva in its cell; 3 and 4, adult beetle. [From Riley]

THE ROSE-CHAFER (*Macrodactylus subspinosus* Fabricius).

Every year in early June, at the time of the blossoming of the rose and grape, residents of central and western Nebraska are plagued by the sudden appearance of swarms of long-legged, grayish brown beetles about one-third of an inch long, which descend into the more cultivated valleys from the adjacent sandhills and do their utmost to devour everything green. These beetles, known usually as "June-beetles," or "rose-bugs," continue their depredations from four to six weeks, disappearing all at once with the last wild rose blossoms, and are then seen no more until the next year. Especially obnoxious have they been during the past three seasons, and many requests for an efficient remedy have been received at the office of the entomologist, but owing to the unusual difficulties encountered in atempting to fight this pest, because of its inaccessibility in the larval and pupal stages and its abundance and remarkable tenacity of life as an adult, very little real help could be given.

The "rose-bug," or rose-chafer as it is more properly called by entomologists, is a native insect afflicting to a greater or less degree the entire northern United States east of the Rocky mountains and north of Oklahoma, Tennessee and Virginia. It is but single brooded annually, and is most common in light, sandy soils, the vast sandhill region of our state forming an ideal breeding-ground for this insect. The beetles appear early in June and begin feeding and pairing at once. Each female lays two or three dozen eggs before she dies. They are deposited singly at a depth of one or two inches below the surface of the ground, and, after a period of two to three weeks, hatch into larvae which feed upon the grass roots within reach. By fall they have become full-grown grubs, and before the advent of winter work down into the earth for several inches, beyond reach of the frost, constructing a small cell in the earth within which they pass the cold season. With the warmth of spring they work upward again, and in late April and early May pupate at a depth of an inch or so. In three weeks or a month the adult beetles are developed. They then emerge from the ground and spend about three weeks devouring all the vegetation they can and laying eggs for the next generation.

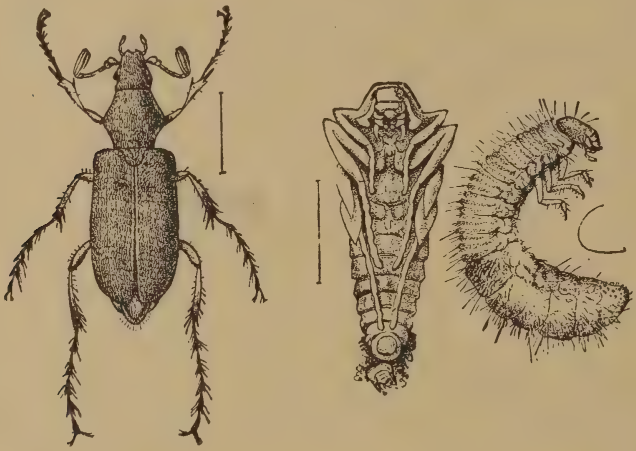

Fig. 8. The Rose Chafer: adult beetle, pupa and larva. [After Riley, Insect Life, ii, pp. 295-296.]

By preference the rose-chafer eats the blossoms, foliage and fruit of roses and grapes, but it by no means confines its attention to these plants. Fruit trees such as apple, pear, plum, cherry, peach and mulberry are eagerly and quickly defoliated and stripped of their blossoms or young fruit, while raspberry, blackberry, strawberry and currant plants are attacked with almost equaly severity. Following these the insect turns its attention to garden truck, field crops and flowers. The potato, sweet potato, tomato, squash, pumpkin, cabbage, bean, pea, rhubarb, corn, wheat, hollyhock, peony and Virginia creeper are the plants most frequently mentioned as the subjects of attack aside from the fruits. Shade trees, especially elms, are defoliated, and even the cocklebur does not escape. In fact the insect is a practically omnivorous feeder, and the soft parts of most available plants are eaten.

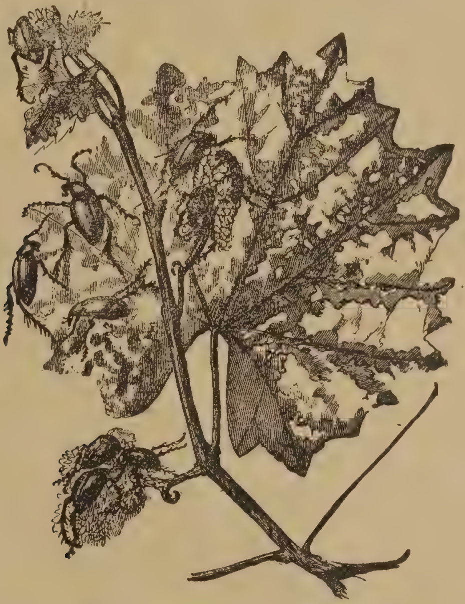

Fig. 9. Rose-chafers attacking a grape leaf. [After Marlatt, Yearbook for 1895, p. 397.]

The beetles are most active in bright, warm weather and during the middle of the day, and under such conditions fly readily, migrating from their breeding grounds in search of better feeding localities.. In the coolness of early morning and late evening and in cold, wet weather they move about but little, and do not feed to any considerable extent. During wet weather little or no migration is attempted, but the beetles eat the nearest food plant whatever it may be. When a beetle settles down upon a plant it usually remains there until disturbed or until the food is exhausted when it moves on to the next plant.

While this insect is found over the whole of the state, as a pest it is not to be compared in southeastern Nebraska with the central and western portions of the state. The lack of extensive sandy areas in the southeastern counties restricts the insect in the item of suitable breeding grounds, and it is consequently not very abundant, but has been reported as more or less injurious east of Thayer and Stanton counties. In the sandhill counties where it has a continuous breeding ground approximating one-fifth of the state, and especially in the area covered by Holt, Brown, Rock, Cherry, Thomas and Custer counties, it is probably the worst insect pest to be contended with. There the beetles come in swarms that fill the air and almost cover the trees upon which they settle to feed, taking everything by storm. In much of the above mentioned region the roses and many of the fruits have been practically taken for the past three seasons. Frequent reports are sent in of young ducks and chickens being killed by eating these insects, one of our correspondents having lost ten young ducks in this manner.

Fighting the rose-chafer is a very difficult and uncertain process. In most insects we find the larval or pupal stages give us some avenue of attack, but here the breeding area is so vast and the abundance of the insects so great that we can hope for nothing along this line. The only feasible course it to defend our crops as best we can when the beetles come, and even here we can do but little. Spraying seems to be ineffective, for while arsenites will kill the beetle they act so slowly that the trees are stripped before the beetles die, and already fresh beetles are at hand to replace the dead ones. It may require a couple of days of feeding on poisoned leaves to kill a rose-chafer, and during that period a half dozen may have emerged to take its place. Contact poisons such as kerosene and pyrethrum are nullified because of the wing covers which fit closely over the breathing pores, and protect them from the entrance of foreign matter. Our correspondents have tried arsenites, kerosene, carbolic dips, and pyrethrum and all agree that the effort was practically wasted. Dr. J. B. Smith has tried experimentally a large number of substances as sprays for this insect, including Bordeaux mixture and other copper compounds, pyrethrum, kerosene, lime, tobacco dust and decoctions, digitalis, cyanide of potassium, hellebore and many others, and all proved wholly unsatisfactory.[1]

In localities where the rose-chafer comes in only moderate numbers and the orchard or garden is small, the liberal planting of spiraeas or early roses, often serves to attract the beetles from the more valuable fruits and vegetables; but in most afflicted regions, as certainly in this state, the numbers of the pest are too overwhelming for such measures to be of practical value. Various mechanical devices on the plan of a large funnel opening into a receptacle containing kerosene, into which the beetles may be jarred from the bushes and trees and killed, have been tried in small orchards and vineyards with some success, but to be beneficial the jarring must be repeated at least twice a day, and in all the use of these contrivances entails so much labor as to prevent their general use. Yet jarring, in conjunction with arsenical spray, preferably arsenate of lead, is the only remedy which can at present be recommended.

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[1] Bulletin of the New Jersey Agricultural Experiment Station, No. 82, pp. 19-33.

The fact that the stay of the rose-chafer is limited to a few weeks, about June 1 to July 10, is about the only consoling feature in its life-history, and can sometimes be practically applied by the selection of such varieties of fruits that the time of blooming may avoid the greater number of beetles.

WHEAT INSECTS.

The insects found infesting wheat during 1905-06 have already been treated of at length in another place.[1] It might be mentioned here, however, that the Hessian fly during 1906 was scarce all over the region in which it had occurred so abundantly during the previous year. The wheat-stem maggot and frit flies were still troublesome during 1906, as was also the wheat straw-worm. The latter insect was particularly numerous in Butler and Red Willow counties. The stalk-borer did little or no harm during 1906, and none of these insects inflicted serious damage during 1907, the wheat being particularly free from insect pests during that year.

THE CLOVER-HAY WORM (*Hypsopygia costalis* Fabricius).

Farmers in this state are frequently annoyed to find, upon opening stacks of alfalfa or clover, that the hay in the bottom of the stack from two to four feet above the ground is filled with small, dark brown caterpillars the workings of which have spolied the hay for feeding purposes. It is cut up into chaff and fine dust, and usually is so filled and matted together with the silky white webs spun by the worms that it has a moldy appearance, while little black pellets of excrement, resembling coarse grains of powder, are abundantly mixed throughout the mass. Cattle will not eat the hay in this condition, and it is believed by many that it would prove injurious to them if they did. Not only are these worms found in open air stacks, but equally commonly in hay stored in barns and mows, so that taken altogether the clover-hay worm annually destroys many tons of hay in Nebraska.

The insect is found both in Europe and America, and the general supposition is that it is a native of the former continent which early became introduced into this country. It now occurs over the greater part of the eastern United States and southern Canada and is especially destructive in the middle western states. It has been present in Nebraska for many years, but only more recently, since the great extension of alfalfa growing in this state, has it increased to become a serious pest. During the past winter a number of complaints have been received from southeastern Nebraska, indicating that the insect is more than usually troublesome.

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[1] Bruner and Swenk, Bulletin of the Nebraska Agricultural Experiment Station, No. 96 (1907).

Unfortunately, the life-history of this insect is still only imperfectly known. The principal points in this connection have, however, been determined, and it is hoped that investigations during the present year will add materially to our knowledge of the pest. The worms are the larvae of a very pretty little moth which may be found in the evening or on cloudy days flying about the haystacks, or in the daytime on the walls of barns in which hay is stored. The moth measures about four-fifths of an inch in its spread of wings and these are of a glossy lilac purple color. The front pair are crossed by two light lines continued back from two large, yellow spots on the front margin of the wing, the hind pair are paler and crossed obliquely by two wavy, yellowish lines, while both pairs are margined with orange and bear long, silky, yellow fringes.

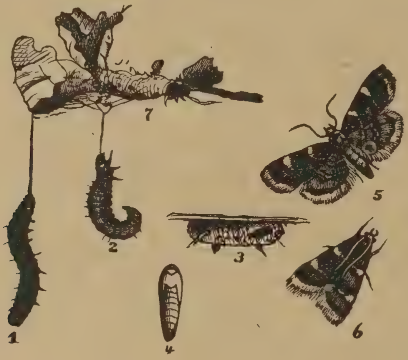

Fig. 10. The Clover-hay Worm: 1, 2, larvae suspended by thread; 3, cocoon; 4, chrysalis removed from cocoon; 5, 6, adult moth; 7, larva covered by silken web. [From Riley, 6th Missouri Report, p. 102.]

The moths begin to emerge in early June from the chrysalids of caterpillars which have lived in the stacks through the winter. Pupation begins in the latter part of May. Moths continue to appear through most of June and the females oviposit either directly upon the hay in the crevices of the stack, or in the heads of the uncut plants in the field from which they are carried to the stack or mow. Larvae of the second brood appear in July, and early in August moths of the second brood emerge. These, in turn, by September have generated larvae which remain in the stack through the winter, continuing to be active even during the freezing weather of midwinter.

When full-grown, the larvae are about three-fourths of an inch long and of a dark olive brown color with the heads more or less reddish, younger individuals being much lighter in color. The segments are wrinkled and bear a few long, white hairs. These larvae are very active, and can wriggle either forward or backward with seemingly equal facility. They live within the white silken webs which they spin in the hay, and often suspend themselves by a thread when moving about. When ready to pupate they creep to some protected nook and there spin the cocoon, a white, silken, oval shaped covering about one-half inch long, transforming within it to the chrysalid. Often this pupation takes place near the outside, but yet within the stack itself. The larvae seem to greatly prefer the bottom of the stack, and quickly make their way to that region, apparently finding better conditions in the compact, moist hay to be found there.

In this state the principal injury by the clover-hay worm is done to alfalfa, at least the great majority of complaints refer to that crop. However, considerable harm is done in clover and timothy hay as well. Probably other plants are affected by it also, indeed Professor Webster records repeatedly rearing it from dry grape leaves gathered in winter.[1]

The best method of dealing with this insect is to prevent so far as possible its gaining and maintaining a foothold in the stack or haymow. Once it has entered, the hay is soon ruined. The worms subsist almost entirely upon old hay alone, and during the summer feed largely in old stacks. Therefore, the new crop should not be stacked upon the old one if there is the slightest infestation of the latter, but the new stack should be made at a considerable distance from the old one. The butts of old stacks which contain worms should be burned, or fed to the hogs if not too badly infested, before the pupation of the caterpillars in the spring. If the insect is working in the barn all the old hay should be thoroughly cleaned out and disposed of and the mows carefully swept before the new crop is put in.

As secondary measures it has been recommended that the bottoms of stacks be salted to prevent moldiness and repel the worms, and to build the stacks on a foundation which gives an air passage beneath. If the emphasized directions are followed, however, it is certain that the numbers of this pest would be greatly reduced, though it is not likely that complete immunity would be secured.

BLISTER-BEETLES (*Epicauta* and *Macrobasis* spp.)

Several species of blister-beetles, and especially the Striped Blister-beetle (*Epicauta vittata*), are noteworthy enemies of growing alfalfa. This particular species was reported as damaging alfalfa in Seward and Clay counties in 1906 and in York and Cuming counties in 1907, during late July and the first half of August. They are found in large bunches on the alfalfa and strip the field as they go, such bunches sometimes containing thousands of the beetles. As these insects were treated in Professor Bruner's "Clover Insects"[1] I shall not discuss them here further than to state that the hopper-dozer can be used effectively against them, or dry straw may be placed near the bunch of insects and the beetles driven upon the straw and burned along with it.

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[1] Bulletin No. 17, N. S. Div. Ent., p. 99, and Bull. No. 31, p. 89.

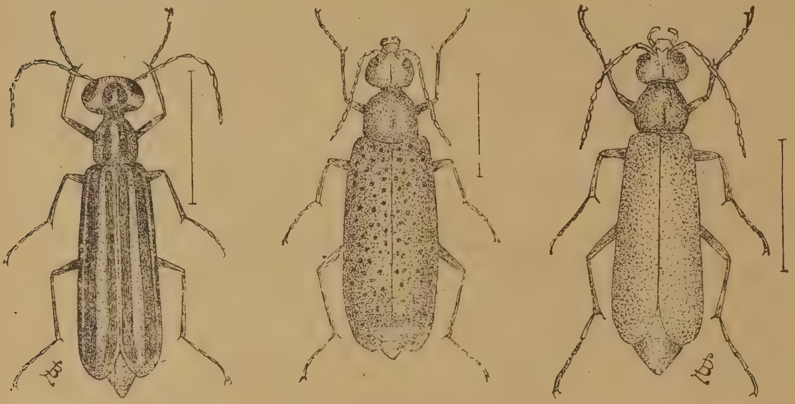

Fig. 11. The Striped Blister-beetle (*Epicauta vittata*), the Spotted Blister-beetle (*E. maculata*) and the Unicolorous Blister-beetle (*Macrobasis unicolor*). [From Bruner Report Nebraska Board of Agriculture, 1891, p. 285, and 1893, p. 76.]

INSECTS AFFECTING CUCURBITS.

The melon aphis, which is undoubtedly the most destructive insect pest among cucurbits in this state, will be fully treated in the following paper. Two other insects were reported as notably injurious to cucurbits during 1907, namely the squash-vine borer (*Melittia satyriniformis*) and the squash bug (*Anasa tristis*). The borer works in the larval stage in the squash or pumpkin stem, causing them to rot and break off at the weakened places and the leaves to wilt and die. These larvae work very rapidly and cause the death of many plants. Harrowing infested fields in the fall to bring the cocoons to the surface and cutting out the borers by hand are the most efficient practices for destroying this insect. The squash bug is a dirty brown bug which injures the squash or melon plants by puncturing the leaves and leaf stalks, and not only sucking its juices but also injecting a poisonous liquid which kills the tissue, so that a number of the bugs can soon destroy a plant. The proper preventive is to go over the plants early in the season and pick up all the bugs and eggs to be found. The latter occur on the under side of the leaf in groups or rows and are easily seen. Then after the crop is harvested the vines should be gathered together and burned.

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[1] Bruner, Annual Report of the State Board of Agriculture, 1898, pp. 265-267.

GRANARY PESTS.

Nearly every year we get complaints of "weevils" in grain and flour. During the last two years such reports have, on investigation, been found to refer to *Calandra granaria*, *Tenebroides mauritanicus* and *Tribolium confusum.* All three of these are beetles and do their injury both in the larval and adult beetle state. The Granary Weevil (*Calandra*) and the Cadelle (*Tenebroides*) devour various grains, principally corn, wheat and barley, while the *Tribolium* is principally a flour-infesting form, though it, too, often attacks the raw cereal. All of these pests are easily destroyed by bisulphide of carbon, a liquid which, as is generally known, turns quickly into a vapor which settles and permeates the mass of grain below it, killing all the infesting insects. In granaries, if tight, a pound or a pound and a half of the liquid to each ton of grain will prove effective, and the grain should be subjected to this treatment for twenty-four hours. If the granary or bin is open and badly infested more bisulphide of carbon should be used. It should be especially observed, however, that no fire of any kind be brought near the granary until thoroughly aired out, and the vapor should not be inhaled too long.

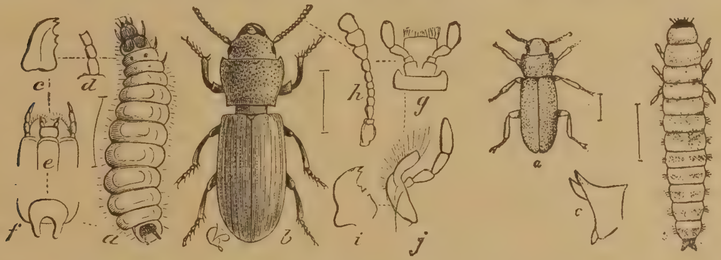

Fig. 12. Two granary pests: ***Tenebroides;*** ***a,*** larva; *b,* beetle; ***Tribolium;*** ***a,*** beetle; *b,* larva. [From Riley and from Bruner, Report Nebraska Board of Agriculture, 1892, p. 246.]

THE FIELD OR CLOVER MITE (*Bryobia pratensis* Garman).

During the fall, winter and early spring of 1907-08 there was an unusual abundance of these mites in houses, and a great number of inquiries were received concerning them. Such reports were received from Richardson, Otoe, Cass, Douglas, Saunders, Washington, Colfax, Dodge, Polk, Boone, Hamilton, Hall, Sherman, Gage, Webster and Red Willow counties, thus showing it to be obnoxious over most of the state. Late in November the first inquiries came in and continued, one or two a day, until late in the spring. The mites are small, oval, long-legged, reddish creatures, very much like the common red spider of the greenhouse. In summer they feed upon clover and various grasses, and upon the foliage of fruit trees, causing them to turn yellow by sucking out the juices. In October they begin to search for hibernating quarters in crevices of fences, under loose bark and similar retreats, and it is then they enter houses and startle the housekeeper by their presence. Being so small they can easily penetrate their way to any portion of the house, under doors and through screens, often in enormous numbers. In the spring they make their way out the same way as they entered and begin feeding upon the clover or fruit tree foliage. Throughout the summer young are produced rapidly and continuously. These mites may be destroyed when hibernating in cellars and other portions of the house by spraying them with kerosene emulsion or sulphur wash, or the free use of pyrethrum powder. Their entrance to houses may be prevented by spraying the walls of the house with kerosene and the lawn surrounding the house with kerosene emulsion, diluted with ten parts of water.

APHIDS INJURIOUS IN NEBRASKA DURING 1906–1907.

BY HARRY S. SMITH,
Assistant to State Entomologist.

In drawing up the following report the writer has made no attempt to treat all the injurious plant-lice found in Nebraska, for practically the entire family belong in that category, but has taken up only those species concerning which citizens of the state have made complaint during the biennium ending March 31, 1908. With the exception of the prodigious increase of the "green bug" in the south, and which scarcely reached Nebraska, we have had no extraaordinary infestations by these insects, and neither of the years just passed can be called "aphid years." Certain plant-lice, however, are more or less abundant every year and in the long run these species by their steady and continuous attack are more of a menace to the agricultural and horticultural interests of the state than even the "green bug" was to small grain in the south. The purpose of this brief report is to assist those who desire to check as far as possible this continual drain upon their resources.

Plant-lice (*Aphididae*) are so familiar to everyone because of the fact that almost every cultivated plant is infested by them, that very little description is necessary. They are all quite small in size, the largest species measuring less than one-fourth of an inch in length and most of the others being very much smaller. They are more or less pear-shaped and in color are usually some shade of green, although there are several species that are almost entirely black. Nearly all develop winged forms at certain times of the year, concerning which more will be said later.

The members of this family have a very interesting and unique life-history. There are two kinds of females, the commoner kind being those which not only give birth to their young alive by a sort of internal budding process (viviparous), but do so without mating with the opposite sex; and the true sexual form which lays eggs (oviparous), before doing which it must mate. These latter, which are wingless, are normally developed only in the autumn along with the males, in order that eggs may be deposited which will carry the species through the winter. The former kind may be again subdivided into those without wings and those with wings, the purpose of the latter being to spread the species and to protect it against extermination by drought or other unfavorable local conditions. The life-histories of these insects, while similar in a general way, present many variations among the different species. In general, as said before, the insects pass the winter in the egg state, hatching in the spring, the first generation being stem-mothers which give birth to living young, these young maturing and also giving birth to young, occasionally developing winged forms. In the autumn the true females lay the eggs from which the stem-mothers hatch in the spring. Many have what is known as an alternation of food plant, *i. e.*, they feed upon one plant during part of their existence, and during the remaining portion upon a totally different kind, as for example the hop aphis which feeds upon the hop until it dries up in midsummer, when it migrates to plum trees where it feeds the remainder of the season and lays its eggs. Several species spend part of their life beneath the surface of the ground and the remaining portion above, as the grape phylloxera or wooly apple aphis. Others exist within galls developed upon portions of the plant which they infest.

The feature which makes these insects so troublesome to farmers and others is their exceedingly rapid method of reproduction, enabling them under favorable conditions to increase to numbers entirely out of proportion to their food plants. This is accounted for not so much by the number of young produced by each individual as by the rapidity with which the young mature and begin to produce young in turn. A single female produces as high as eight young per day, these young all being females which themselves begin to produce young in five to ten days. Huxley has calculated that the progeny of a single aphid if allowed to increase unmolested would in ten generations weigh more than the whole population of China, and some species have at least thirteen generations per year. Such a calamity as this, however, is averted by the natural enemies of these insects, which are of many kinds. The most important of these are the true internal parasites, resembling

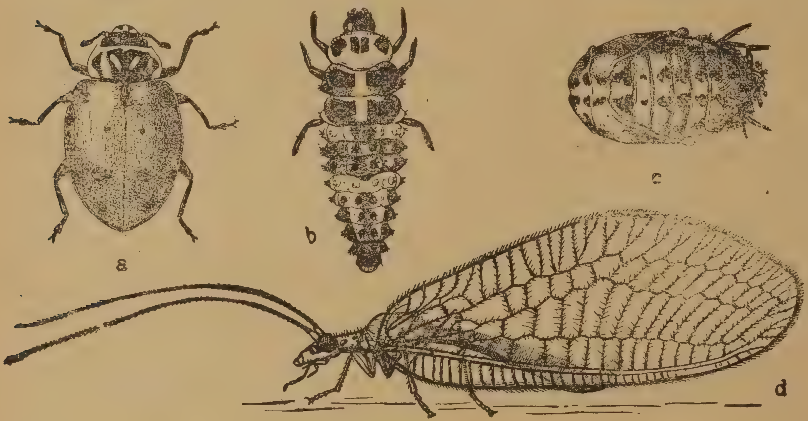

Fig. 13. Some predaceous enemies of aphids: *a*, The Convergent Ladybird; *b*, larva of same; *c*, pupa of same; *d*, a lacewing (*Chrysopa*). [From Chittenden and Marlatt, Bureau of Entomology.]

tiny wasps, which lay their eggs upon the lice, these eggs soon hatching and forming grubs which live within the aphid. These parasites, even when mature, are extremely minute in size, but do an increditble amount of good. Among the predaceous enemies of plant-lice the common ladybirds probably are most efficient, while the larvae of Syrphid flies and the lacewings have keen appetites for these insects and destroy a great many. Occasionally through some abnormal condition of the weather or some other agency these parasites fail to develop in sufficient number, and when this is true, as was the case with the "green bug," a more or less severe infection occurs.

Aphids are peculiar for the so called "honey-dew" which they secrete from the posterior end of the body, this fluid being very attractive to many other insects because of its saccharine nature. Chief among these attracted insects are ants, which render themselves very obnoxious by their careful attendance upon these lice, in some instances caring for their eggs throughout the winter and placing the young, when they hatch, upon the proper food plant in order that they may obtain a good supply of honey-dew. In fact the best remedy for certain root-infesting aphids has been found to be the destruction of anthills in the fields.

Plant-lice belong to a group of insects having a sucking beak by means of which they obtain their nourishment, piercing the surface of the leaves and tender twigs and drawing up the juice from beneath. In this way they differ from the biting insects, which have a pair of jaws and get their food by devouring the tender parts of the plant. This fact is of great importance when we desire to use artificial remedies against insects. While the latter kind can be killed by the use of stomach poisons such as Paris green or arsenate of lead, it is obvious that these poisons would have no effect upon sucking insects like the plant-lice. For destroying this type of insect we must resort to other methods, the most important of which are fumigating with various gases and spraying with insecticides which kill by contact, that is, something which will clog their breathing pores and thus suffocate them. The following insecticides have been recommended in this report:

Kerosene Emulsion.

Common soap	1 pound
Kerosene	2 gallons
Water	1 gallon

Place the soap in the water and boil until thoroughly dissolved, after which remove from the fire and add the kerosene, agitating the emulsion vigorously for a few minutes by running it through a spray pump until it has a creamy consistency. This solution will readily mix with water without the oil separating. Before applying to plants it should be diluted with water to form from 5% to 40% kerosene, according to season and plant.

Whale-oil Soap.

Whale-oil soap	1 pound
Water	8 to 10 gallons

The soap should be dissolved by cutting into small pieces and boiling, and should be used while warm.

These insecticides should be carefully applied with a good spray pump if success is to be attained. As the lice are most numerous on the lower surfaces of the leaves the spray should be directed upward and should be rather coarse in order that it may have sufficient force to wet the leaves thoroughly.

By spraying with much stronger solutions in the early spring before the leaves appear the eggs of these insects may be destroyed, which will obviate the necessity of the more difficult spraying later. For this purpose use a 33 1-3% emulsion of kerosene or a 33 1-3% solution of whale-oil soap.

Bisulphide of Carbon.

The vapor of this liquid is fatal to all kinds of animal life, and especially so to insects. When fumigating with this substance use about one teaspoonful to each cubic foot of space, and be sure to have the receptacle in which it is evaporated tight so that the fumes will all be retained. Great care must be taken in the use of this material to see that there are no lighted cigars, pipes or fire of any kind near by, for the fumes are exceedingly inflammable.

THE SPRING GRAIN APHIS OR "GREEN BUG"

(*Toxoptera graminum* Rondani).

This insect was the occasion of a great deal of alarm among the farmers of Nebraska during the spring and early summer of 1907, which, had they known something of its character and habits, could have been largely avoided. While we must not lose sight of the fact that millions of dollars damage was done by this insect in the states to the south of us, here in the north it was nothing more serious than a great opportunity for those who manipulated the grain market to bull the price of wheat, and hence was really money in the pockets of our farmers who had grain to sell, although it is possible that the inevitable reaction which followed more than offset this appreciation in price.

Early in the spring of 1907, when this insect was doing so much damage in the south, and was receiving so much notice by the newspapers throughout the entire country, farmers began to send in various kinds of insects found in the wheat fields, the accompanying letters reflecting the anxiety the writers felt for the future of their wheat crop. However, the Entomologist was always able to put them at ease in this regard, as the communications were almost invariably accompanied by some common local wheat aphis, or any other insect which was found upon wheat and which was of a green color. On April 17th, at the urgent request of some of our leading grain men, the writer was sent into the field to ascertain whether or not the "green bug" had really reached this far north. Proceeding to the south-central portion of the state, in company with the grain merchants mentioned above, he examined a great many wheat fields in the vicinity of Kearney, Minden and Hastings and the region to the southwest of these towns. The "green bug" scare in that portion of the state visited was found to be based entirely upon the common occurrence in the wheat of a species of *Forda*, a root-infesting form which had, indeed, become quite numerous, but had not done noticeable damage.

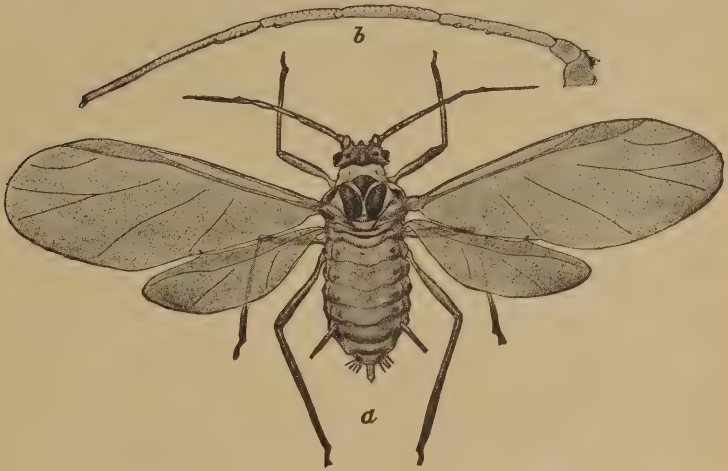

Fig. 14. The Spring Grain Aphis or "Green Bug": *a*, winged migrant much enlarged; *b*, antennae of same highly magnified. [From Pergande.]

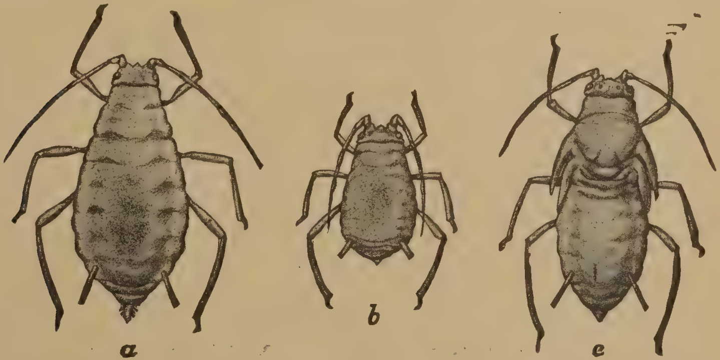

Fig. 15. Spring Grain Aphis or "Green Bug": *a*, wingless female; *b*, larva; *c*, pupa. Much enlarged. [From Pergande.]

Having satisfied himself that the insect had not as yet reached Nebraska, and having allayed somewhat the fears of the local grain men, the writer returned to headquarters. About a month later, however, another tour of inspection along the southern border of the state revealed the fact that the "green bug" had at last reached us, but not in great numbers. It was found by the writer to be present from near Bloomington east to Pawnee City and north to Lincoln. The lice in these localities were quite extensively parasitised by the *Lysiphlebus*, a very small wasp-like insect, so that very little apprehension was felt for the crop of small grain.

The "green bug" is an imported species from Europe, and was first found in abundance in the United States during the year 1884. It is extremely erratic in its nature, there always being several years between the outbreaks. Inclusive of the one just passd, there have been three disastrous invasions of this insect in the United States, the first one occurring in 1890, affecting Texas, Missouri, and portions of Illinois, Indiana, Kentucky and Tennessee. The second infestation happened in 1900 and was less in extent than the preceding, although equally severe. During the season of 1907 this insect probably eclipsed any of its former records in amount of injury. Professor Washburn estimates that Oklahoma alone lost $10,000,000.

The explanation of the change in this insect from almost harmless numbers to equal rank in destructiveness with some of our most serious pests, lies in the reduction of parasitism due to abnormal climatic conditions. It will be remembered that following a rather mild winter a late cold spring set in, which while not cold enough to check the increase and spread of the "green bug" caused the little parasites to remain dormant during this part of the season. According to Professor Webster this aphis will breed freely at temperatures ranging as low as 32° F., while the *Lysiphlebus*, its parasite, is dormant at any temperature below 56°, thus giving a stretch of 24° wherein the "green bug" can breed unmolested. The well known prolificacy of the insects in the family to which this one belongs was sufficient to place the aphis beyond all normal bounds when during a greater portion of the winter and spring in the states to the south of us the temperature ranged between the two minima mentioned above. Of course it is not likely that the "green bug" bred in Nebraska during the winter, but as the weather began to warm up somewhat and the wheat to the south became more aged and less palatable, winged forms were developed in great numbers. These winged females, on getting into the air, were borne long distances by the wind, but finally alighted and at once began giving birth to living young. It was just after a continuous high wind from the south that the aphis was first noticed upon grain in this state. Not long after, however, the weather began to approach more nearly normal conditions, thus giving the little parasite an opportunity to bring the aphis under complete control.

Webster says that the species breeds freely on wheat, rye, oats, barley and corn, besides many wild grasses. In Nebraska the writer has found it upon the first two only.

The life-history of this insect does not differ essentially from that of other members of the family Aphididae. The males and egg-laying females appear in the fall of the year, and the eggs are deposited upon the wheat. In Nebraska the species is probably carried over winter by this method alone, but farther south the viviparous females (those bearing young alive) are active during the entire winter and produce young in some numbers throughout the season. During the spring, if the weather is dry or there are too many lice subsisting upon the grain, causing it to become less thrifty, winged females are developed which, as suggested heretofore, get up into the air and are borne long distances by the wind to infest other grain fields, which it does not take long to do on account of their rapid mode of reproduction. During the month of June this insect leaves the grain and migrates to wild grasses, which they abandon in the fall, again taking to the grain fields.

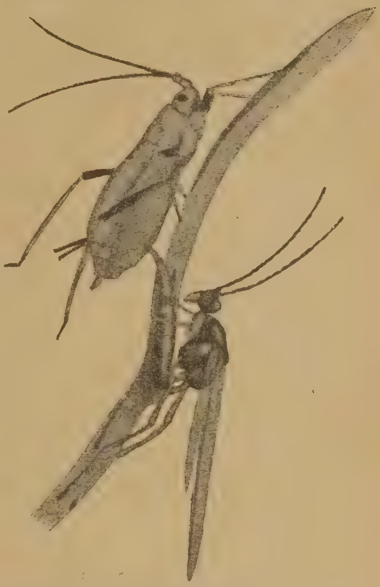

Fig 16. *Lysiphlebus* attacking grain plant-louse. [From Washburn.]

This species may be distinguished from the other lice found upon small grain by the lighter green color and by the wing venation, the third discoidal vein being branched only once in this species, while in the two other winged aphids which infest wheat in Nebraska it is twice branched.

The little parasite, *Lysiphlebus tritici*, is a minute wasp-like creature which stings the aphis, at the same time depositing an egg within its body. This egg soon hatches and the larva develops within the body of the plant-louse. At about the time the larva is ready to emerge in the form of a mature wasp the aphis becomes greatly swollen and turns to a dark brown color. In emerging this parasite makes a circular cut in the body-wall of the louse. All this requires a period of about ten days, when the new parasite is ready to deposit eggs in the bodies of other lice. The great amount of good accomplished by this tiny creature can be appreciated only by those who have gone into the field and observed the business-like way in which it goes at its work and the large percentage of the lice it destroys.

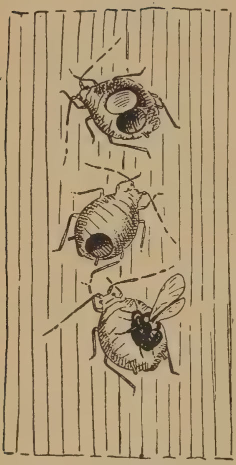

Fig. 17. Dead "Green Bugs," showing hole from which the matured parasite, *Lysiphlebus tritici*, emerges. The top figure shows the lid still attached, but pushed back; the bottom figure shows the parasite emerging. Enlarged. [From Webster.]

Aside from this parasite there are several predaceous insects which materially assist in the destruction of the "green bug." Most prominent among these are the convergent ladybird (*Hippodamia convergens*) and the nine-spotted ladybird (*Coccinella 9-notata*), which both in the larval and the adult form destroy many aphids of all kinds.

As suggested in the beginning, the "green bug" did no appreciable damage to grain in Nebraska, it being at no time as numerous as several other species of aphids, and our farmers have very little to fear from this insect, owing to the fact that our winters are too cold for it to breed here during that season. Those which migrate from the south during the warm days of spring will probably always be kept down in numbers by the little parasite, which because it also infests our native plant-lice, is always ready to receive them. It is unnecessary, therefore, to take space for discussing remedial measures; even if it were imperative that some artificial remedy or preventive be adopted there is little or nothing that can be recommended at this time save rotation of crops and better farm methods.

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THE ENGLISH GRAIN APHIS (*Macrosiphum granaria* Buckton).

No doubt most of the reports and inquiries in regard to the "green bug" during the spring of 1907 referred to the above species. It was found quite abundantly over almost all the territory where wheat was grown, principally the south central portion of the state, and did appreciable damage by weakening the plants, the heads either failing to fill properly or not developing at all. This insect is present in Nebraska in some numbers every year, and while it is a more or less steady and continuous drain on the small grain crop, it is not likely that it will ever become so dangerous a pest as the "green bug" is in the south.

The southern tier of counties from Harlan to Pawnee and northward to the Platte river embraces the region where the wheat was most infested. In some fields these insects were very numerous, but generally they were quite extensively parasitized by *Lysiphlebus* and fed upon by the convergent ladybird, which was very abundant in the fields, being seen everywhere running up and down the wheat stalks in quest of the lice.

During the year 1879[1] this insect was recorded from Illinois under the name *Siphonophora avenae*. Subsequently it has spread westward to North Dakota and east to the Atlantic, and is also common in the north and south. It is a native of Europe as its common name implies.

The English grain aphis resembles the "green bug" but may be distinguished from that insect as stated in the discussion preceding. From the following species it may usually be distinguished by having the third branch of the discoidal vein longer, the legs are not so uniform in color, the apices of the femora and tibiae being dark, and by having dark spots on the abdominal segments.

The life-history of this insect is but imperfectly known, but it is not likely that it differs materially from that of other grain lice. The wingless females probably survive the winter here in Nebraska, as the writer has found them early in the spring during very cold weather, working beneath the surface of the ground near the roots of the wheat plant. Like the "green bug" this leaves the small grain when it becomes mature and migrates to the related wild grasses where it remains until the fall wheat comes up, when it returns to that plant. Besides feeding upon wheat, oats, barley, rye and corn, it has been found upon flax, timothy, millet and various wild grasses.

The remarks pertaining to remedies and preventives in the discussion of the preceding insect will apply to this and the following one as well. There is very little to be done except to hope for weather which will enable the parasites and other natural enemies to settle the problem for us.

THE EUROPEAN GRAIN APHIS (*Siphocoryne avenae* Fabricius).

Associated with the two preceding species the above insect was found in some numbers, although not nearly so numerous as the latter. Specimens were taken at various places within the wheat belt, it being found most commonly from Nuckolls county eastward. The insect probably has always been present to some extent in our wheat, and has never yet become so numerous as to be a serious menace to small grain.

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[1] Thomas, Eighth Report of the Noxious and Beneficial Insects of Illinois, p. 53.

The life-history of the European grain aphis is one about which entomologists are not agreed, some claiming that part of its life cycle is spent upon the apple and their opponents maintaining that the apple form is an entirely different species. This problem will doubtless be solved in the near future, and will bear considerable weight in the control of the insect upon either wheat or apple. According to Mr. Pergande of the U. S. Bureau of Entomology, it has been found upon 22 different plants, 9 grains and related wild grasses, 8 trees and 4 weeds or herbs, it being a rather general feeder for an aphid.

In appearance this insect is very similar to the English grain aphis and the "green bug," but may be distinguished from them as indicated in the preceding pages. Observers say that it is destroyed by a great many predaceous and parasitic insects, although none of these have as yet been reared from this species in our insectary.

ROOT-INFESTING APHIDS (*Forda occidentalis* Hart and *Geoica* sp.)

The former of these two insects was found in great abundance in almost all wheat fields examined while investigating the "green bug." At Kearney it was especially numerous, the writer having examined many fields in that vicinity on April 17, 18, and 19, as mentioned on a preceding page. Some plants in these fields supported as high as forty lice, although the field as a whole was not noticeably damaged, and usually a much smaller number were found upon the plants. In the country surrounding—Minden and Hastings it was also abundant and it was found rather commonly at Lincoln. This aphis is always attended by a small brownish ant, the species of which has not yet been determined.

Forda occidentalis is a small olive-green louse, very robust and plump when mature, and very sluggish in action. So far the winged form is unknown to the writer. It further differs from the above-ground aphids previously treated by the absence of the honey-tubes or nectaries. Nourishment is obtained by sucking the juices from the root and underground portions of the wheat and other plants, where the louse is probably placed by the ants just referred to. So far as is known to the writer, the life-story of this insect has never been worked out. It has been found upon the roots of corn, blue-grass and shepherd's purse. I believe it has not heretofore been found infesting wheat, but this and the following species probably will never become sufficiently harmful to make it necessary to take up remedial measures against them.

The other plant-louse found infesting the roots of wheat I have tentatively identified as a species of *Geoica*. Superficially it resembles the former in shape, but is of a white color, and has several microscopical characters by which it may be distinguished from that species. In habit it is very much like *Forda*, living beneath the surface of the earth upon the roots of wheat, and is also attended by a small brown ant. So far only the wingless oviparous female has been found in Nebraska.

This latter insect was observed only at Aurora, during October 1907, and upon volunteer wheat scattered through the sowed grain. It was quite abundant here and caused the wheat to change to a sickly yellowish green color.

THE CORN ROOT APHIS (*Aphis maidi-radicis* Forbes).

This insect has been reported as doing considerable damage during 1906-1907 in that portion of Nebraska lying north of the Platte river comprising the second and third Congressional Districts. Although the complaints against this insect have not been numerous, we should not draw the conclusion that it has done little damage to our corn, for as a rule the farmer, unless he is an exceptionally close observer, will attribute the work of this root aphis to drought. Professor Forbes, the leading authority on corn insects, says that this pest is of equal rank with the chinch bug and army worm in its destructiveness because of its wide distribution and steady and continuous attack. It no doubt occurs to some extent throughout the entire corn belt, having been recorded from Illinois, Indiana, Ohio, Minnesota, Kentucky, Maryland, New Jersey and Delaware, besides this state.

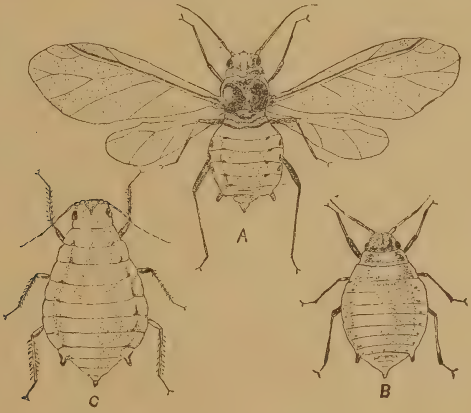

Fig. 18. The Corn Root Aphis: *a*, winged viviparous female; *b*, apterous viviparous female; *c*, apterous oviparous female. [From Forbes.]

The corn root aphis is a small, oval insect of a bluish green color, and with prominent nectaries, which stand erect or lean slightly backward. In this species we find both the winged and wingless forms. They obtain their living by sucking the juices from the roots of the corn, where they may be found clustered together or carried about by scurrying ants.

Although corn is its main food this insect has been found upon many tame and wild plants, including broom-corn, sorghum, crab-grass, smartweed, foxtail grass and several others. It passes the winter in the egg state underground in the nests of the common small brown ant. When spring opens up and the smartweed begins to grow the little ants pick up the young lice which have hatched and place them upon the roots of this plant, where they live until the corn starts to grow, when they are usually transferred to the corn roots. Here they remain, occasionally developing winged forms which come above the ground and fly to other fields, the pest being spread in this manner. In the fall the males and egg-laying females are developed, both of which live under the surface of the ground. The eggs laid by these females are cared for by the ants which take them deep into the earth during cold weather. Many methods of combating this insect have been tried, almost all of which have some value, although it would be difficult to say which would be the best when used alone. As the young insects rely almost entirely upon the ants to place them upon the roots of the corn it would seem that to destroy the ant nests together with their occupants would tend to keep the pest in check. This has been tried and found to be a quite efficient remedy. It is best accomplished by deep plowing and harrowing the corn ground late in the fall after the corn is out and before the ground is frozen too hard, or early in the spring. This method will break up the nests and expose the lice to the cold air which is fatal to them.

Inasmuch as the young lice subsist upon the roots of smartweed and foxtail grass until the corn comes up, it is good practice to keep the corn and surrounding fields clear from these plants, thereby starving the aphis. This method will be materially agumented if the planting of the corn be delayed as long as possible.

A judicious rotation of crops has been found to aid materially in diminishing the attack of the insect under discussion, as corn raised upon ground not in corn the year before would be less likely to be stocked with aphis eggs, although it feeds upon many other plants also. In this way the crop would be exempt from infestation until invaded by winged specimens from other fields, when the corn would have sufficient start to be able to withstand the attack.

In the attempted control of this insect many experiments have been tried by treating the seed corn with some repellant which would keep the ants and lice away from the roots, and a few of these have been attended with some degree of success in other states. Professor Forbes of Illinois has carried on some extensive experiments along this line during the past two years. The repellants he used were as follows: Kerosene, one teaspoonful to a gallon of seed corn, stirred in just before planting; oil of lemon, a 10% solution in alcohol; carbolic acid or formalin, 3% solution in water. He used to one gallon of seed corn, 3 ounces of the oil of lemon mixture or the carbolic acid solution, or 6 ounces of the formalin solution.

One drawback of this method is the fact that it destroys more or less the germinative power of the seed. Whether or not any of these latter methods will prove reliable in Nebraska is yet to be determined. It has, however, been sufficiently demonstrated that the destruction of ant hills and weeds, and a short rotation of crops will prove effectual in its control.

THE CORN LEAF APHIS (*Aphis maidis* Fitch).

This common insect is familiar to all farmers in the corn belt, it being the one found so frequently upon broom-corn and sorghum and also upon Indian corn. It works upon the leaves, between the leaves and main stalk and upon the tassel and the silk of the ears, where it is thought to do some damage to the process of fertilization of the kernel. It is, however, rarely injurious to corn and can not be classed as a dangerous pest.

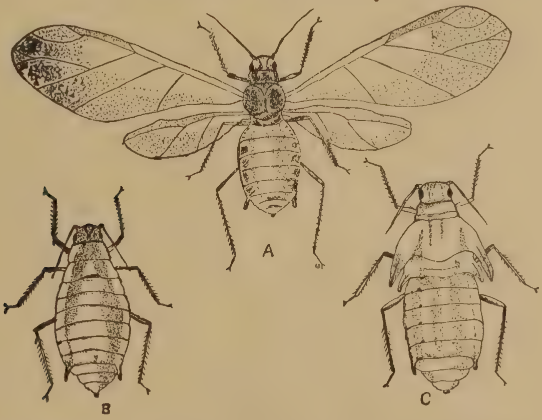

Fig. 19. The Corn Leaf Aphis: *a*, winged viviparous female; *b*, apterous female; *c*, pupa. [From Forbes.]

The corn leaf aphis is of very general distribution, being found throughout the United States where corn, broom-corn and sorghum are raised, these being its principal food plants. In appearance it very closely resembles the preceding form, and was thought for a long time that the two were only varieties of a single species. It has the same oval shape, and is pale green in color with the greater part of the legs, antennae and nectaries black. The head and abdomen are also marked with black. The winged form is somewhat differently marked.

Its life history is as yet rather uncertain. It appears upon corn during July for the first time, but from whence it comes is unknown. The insect remains upon this plant throughout the summer, until frosts come, when it disappears, but where to is not known.

It is hardly necessary to adopt artificial measures against this insect in Nebraska.

THE CHERRY APHIS (*Myzus cerasi* Fabricius).

During the season of 1906-1907 this insect did considerable damage and caused a great deal of annoyance to citizens of Nebraska who were growers of either cherries or plums. It has been widely spread over the eastern part of the state, and no doubt extends to the western portion where either plums or cherries are raised, although we have no records of its being injurious.

The cherry aphis is a medium sized plant-louse, the adult measuring about six hundredths of an inch in length. It is of a plump oval shape and black or dark brown in color. There is also a winged form. They feed in clusters of great numbers upon the lower side of the leaves, about the tender twigs and upon the young fruit, from which they suck the juices and often defoliate the trees. In this way they are very injurious to young trees, stunting their growth and causing the fruit to fail to develop on the older ones. The leaves infested by these insects curl up with the lice inside, forming a most excellent protection for them.

This aphis is attacked by a great many natural enemies, among which several species of ladybirds and Syrphid flies have been observed in Nebraska. *Tryoxys cerasphis*, a small parasitic wasp, has also been recorded as destroying this pest, although we have never bred it in this state. These beneficial insects are attracted in great numbers when the cherry aphis becomes numerous, and often destroy them sufficiently that the defoliated trees will again leaf out.

The life-history of this insect is not radically different from that of other members of the family. It has no alternate food plant and works entirely above ground, differing in this respect from the following insect. The lice make their first appearance in early spring and increase very rapidly until midsummer, when they become less abundant. Late in the season, about September, they again become numerous. The true sexes appear and the females deposit their eggs near the leaf buds and in crevices of the bark during the month of October. These eggs hatch in the spring to produce the asexual generation.

Either the kerosene emulsion or the whale-oil soap solution is a satisfactory method of treatment against these lice. As they cause more or less curling of the leaves it will be necessary to apply the insecticide with considerable care and thoroughness in order to reach those which are protected in this way. The insect increases so rapidly that if a few are left it will be only a short time until they again become numerous. As plum and cherry trees have a rather tender foliage it is not advisable to use a stronger emulsion of kerosene than 7%, and this is of sufficient strength to destroy most aphids.

THE GREEN PEACH APHIS (*Myzus persicae* Sulzer).

During the past year this peach aphis has been fairly numerous upon the peach trees of orchards in southeastern Nebraska. Although not so dangerous a pest as the black peach aphis, nor so difficult to control, it has done considerable damage by partially defoliating the trees and retarding the development of the young fruit.

The winged form of this species is pale green in color with the thorax dark and a brownish blotch upon the disk of the abdomen. The wingless form is greenish and the eggs shining black. It infests the trees above the ground only.

The remedies recommended for the preceding insect apply equally well to this one. If kerosene emulsion is used be sure that it is well emulsified, and not stronger than 7%, else injury to the trees will result.

THE WOOLY APPLE APHIS (*Schizoneura lanigera* Hausmann).

This very destructive insect has become altogether too common in Nebraska during the past few years, the seasons of 1906-1907 being no exceptions. Two forms comprise this species, one of which works upon the roots of the apple tree, and the other which feeds upon the young water shoots and scars upon the trunk. When not surpressed it is especially injurious to nursery stock. The above-ground form does very little damage, but the other form, because of poisoning the roots attacked, causes an abnormal growth and consequent decay, which in time actually kills the tree.

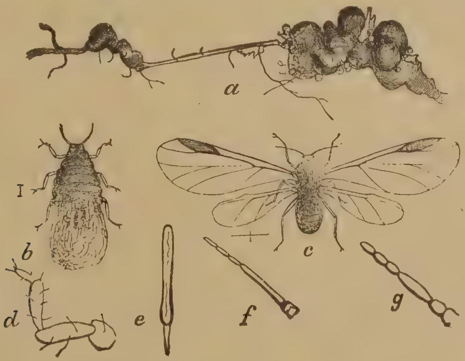

Fig. 20. The Wooly Apple Aphis: *a*, rootlet showing galls; *b*, apterous form; *c*, winged form; *d*, *e*, *f*, *g*, parts showing structure. [From Riley.]

The wooly apple aphis was first described in 1801, although it was noted in England as infesting stock imported from America in the year 1787, and called "American blight." It has been found infesting apples in Europe, Australia, New Zealand, Argentina, Chile and India and has been recorded from three-fourths of the states in the Union. This remarkable range is due to the insect having been transported upon nursery stock.

This pest is of the usual form common to plant-lice. The wingless female when adult is about one-tenth of an inch in length, head, legs, and antennae dark, and the abdomen yellowish. A white powder covers the insect and a tuft of flocculent down grows upon the back. During the autumn the winged females appear which assist in the distribution of the insect, and probably give rise to forms which lay the winter eggs. The root form passes the winter in the larval stage.

Natural enemies of this aphid are fairly numerous, several species of ladybirds feeding upon it, besides the Syrphid fly, *Pipiza radicum*, and a parasitic wasp, *Aphelinus mali*. In case of attack upon nursery stock, however, we cannot depend upon these enemies to control the insect, and close watch should be kept by the persons buying young apple trees to make sure that it is not present, infested stock being refused. When found in nurseries the following methods of procedure are advisable:

Carbon bisulphide; several holes should be made about 1½ feet from the base of the tree, these being about 10 inches deep. Pour one ounce of the chemical into each hole, immediately closing it. The fumes given off will at once kill the lice.

Hot water, heated to near the boiling point and applied about the base of the trees; sufficient quantity should be used to wet the soil thoroughly to a depth of several inches.

Nursery stock, when only slightly infested, can be freed from this pest by dipping the roots in strong soap solution heated to about 150° F., or in a 15% emulsion of kerosene.

THE BOXELDER APHIS (*Chaitophorus negundinis* Thomas).

This plant-louse has done considerable injury to the boxelder trees of the state for several years past, and has been especially injurious during the last two years. In many cases the growth of the trees was checked and some were very seriously injured.

The boxelder aphis was first described in the year 1878 by Dr. Cyrus Thomas,[1] then State Entomologist of Illinois. Since that time it has been recorded from most of the states where the boxelder is grown, and has also been found doing great damage to that tree in the Dominion of Canada. It was first recorded from Nebraska in 1888 by Professor

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[1] Bulletin of the Illinois State Laboratory of Natural History, No. 2, p. 10.

Lawrence Bruner,[1] who published a rather extensive article on its life-history and habits in a report entitled "Injurious Insects of 1888."

The life-history of the boxelder aphis in brief is about as follows: Early in the spring, even before the leaves start, the stem-mothers hatch from the eggs which are laid in the fall, and which carry the species through the winter. These minute lice crawl to the buds where they await the growth of foliage and tender shoots, that they may feed upon the sweet sap. The stem-mothers continue to give birth to young during the spring and summer months, these young occasionally developing wings by which the species, aided by the wind, is spread from tree to tree. Late in the fall, when cold weather sets in, the true sexual females as well as the males are produced. These females do not give birth to living young, but deposit eggs, before doing which the sexes must mate. The eggs, which are shining black and quite large for the insect which deposits them, are placed in little protected crevices in the bark and between the lateral buds and the stem. As stated above, these hatch in the spring, when the same round of life is repeated.

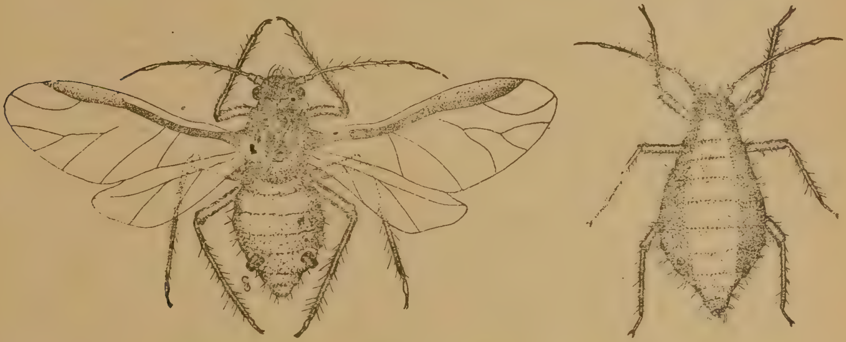

Fig 21. The Box Elder Aphis: apterous and winged viviparous females. [Author's illustrations.]

The viviparous females are pear-shaped insects of a green color similar to that of the leaves and twigs upon which they are found, and are rather more hairy than the average plant-louse. The winged specimens have the lobes of the thorax black and the legs rather pale. Usually this insect feeds upon the lower surface of the leaf, but when abundant it may be found upon any portion of the leaves or even upon the leafstalk and young twigs, often completely covering them and so weakening the flow of sap that the foilage does not develop.

This aphis is very conspicuous because of the copious honey-dew which it secretes upon the stems and leaves, giving them a glossy appearance. This substance even drops upon the sidewalk beneath, rendering it filthy and unsightly.

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[1] Bulletin of the Nebraska Agricultural Experiment Station, No. 2, p. 5.

The boxelder aphis has a number of enemies in nature, both among the predatory and the parasitic insects. Among these are found several species of the brightly colored ladybirds. The one found feeding upon this aphis in greatest numbers in Nebraska during the present spring is the *Hippodamia convergens*, which is shown in the accompanying illustration. The larva of this beetle is oblong in shape, spiny, black with reddish yellow markings, and is very active in its movements. The eggs are yellow in color and are deposited in clusters on the twigs where plant-lice will be readily accessible. Many other species of ladybirds prey upon the boxelder aphis in Nebraska. Several species of Syrphid flies have been found to feed upon this insect in their larval or maggot form. They are usually greenish or yellowish white in color, sometimes with dark markings, and find their food by clinging to the branch with the posterior end of the body, while they grope about in a half circle with the anterior or head end. The delicate lacewings (*Chrysopa*) also feed almost entirely upon these aphids and do a considerable amount of good toward keeping them in check.

In addition to these predatory forms, of which there are several not mentioned for lack of space, are the true internal parasites which during their larval and pupal stages live within the body of the louse.

The cheapest and at the same time the most effective method of handling this insect is a careful application of the proper insecticide in the form of a spray. For this purpose the writer would recommend the use of kerosene emulsion or whale-oil soap solutions. Before applying the former to boxelder trees, which have a rather tender foliage, it should be diluted so as to contain from 5% to 7% kerosene. The best results are obtained when soft water is used.

THE MELON APHIS (*Aphis gossypii* Glover).

For several years the melon aphis has been injurious to pickle growing in Nebraska, which is a very extensive industry in this state. It also infests melons to a great extent. Chittenden says that it is, "taken season after season, the worst aphis occurring in this country." It is distributed over the entire state, but is most injurious in the eastern portion. Besides being of pretty general occurence over the United States, it has been recorded from Mexico, West Indies, Brazil and Australia.

This louse is usually green or greenish yellow in color, although sometimes it is almost black, with black nectaries and pale antennae. The winged form is more slender and the abdomen is comparatively lighter in color than in the apterous female.

The melon aphis begins its atack early in the spring and continues it throughout the summer, probably laying its eggs upon weeds in the fall. Winged forms are being continually developed, which migrate to

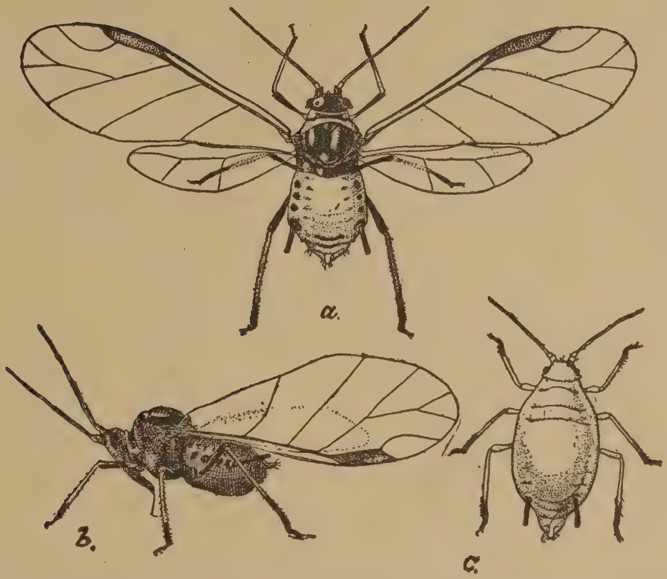


Fig. 22. The Melon Aphis: *a*, winged female; *b*, dark female, side view, sucking juice from surface of a leaf; *c*, wingless female. All greatly enlarged. [After Chittenden.]

other fields and thus the species spreads rapidly. Besides feeding upon the various cucurbits it infests cotton, orange, strawberry, clover, and many other cultivated plants, besides an endless number of weeds; in fact it is not at all particular about its food plant.

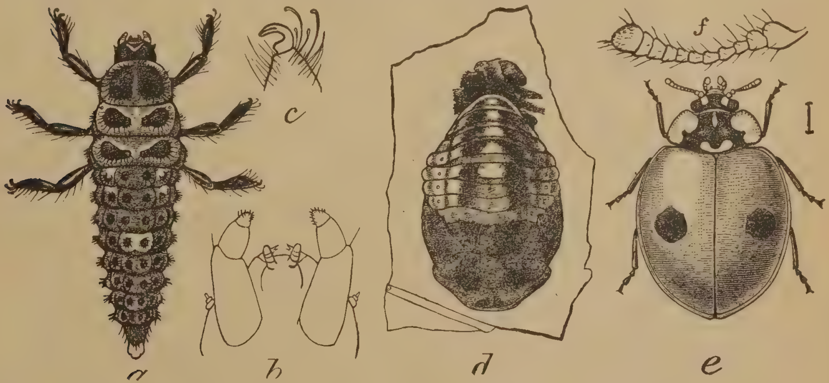
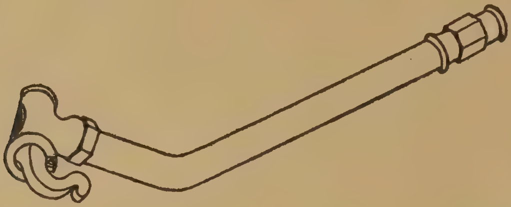


Fig. 23. The Two-spotted Ladybird, which feeds upon many kinds of aphids; *a*, larva; *b*, mouth parts of same; *c*, claw of same; *d*, pupa; *e*, adult or beetle; *f*, antenna of same. All enlarged. [From Marlatt.]

This aphid is very much attacked by the natural enemies which usually prey upon aphids, about 35 having been recorded as preying upon this species (Chittenden). In spite of all these beneficial insects, however, it occasionally gets beyond their control and becomes very destructive.

It injures the plant by collecting in large numbers upon the under side of the leaves, causing them to shrivel and wilt, often ending in the death of the plant. Close watch should be kept by growers of cucurbits in order to detect this pest at the outset, when it is much easier to control. The under sides of the leaves should be examined every day if possible, and as soon as the lice are discovered, remedial measures should be employed.

Fumigation with bisulphide of carbon is often recommended against this insect and is successfully used. This is accomplished by turning tubs, pails, etc., over the infested hills, under which the carbon bisulphide is evaporated. (See page 310).



Attachment for underspraying. [Author's illustration.]

Spraying with kerosene emulsion or soap solution is a very difficult process owing to the fact that the lice work entirely on the under side of the leaf and to the interlacing of the vines. An elbow sprayer is an absolute necessity for spraying the under side of the leaves. The kerosene emulsion should be diluted so as to contain 5% to 7% kerosene.

All weeds in the vicinity of the field should be burned during the winter as should also the vines, which form hibernating quarters for the aphids or places in which they may deposit eggs.

THE BOT-FLIES AFFECTING LIVE STOCK IN NEBRASKA.

BY MYRON H. SWENK.

Among the numerous insects injurious to common domesticated animals in this state, thereby rendering themselves obnoxious to the stock raiser, the several species of bot-flies rank among those of first importance. These insects form a compact little family of less than a hundred species, the *Oestridae* in the order Diptera, and are medium to large, heavy bodied, hairy flies, especially characterized by the aborted mouth parts which are practically incapable of taking in food. The larvae live parasitically within the bodies of mammals, and very rarely, birds also. These are thick, fleshy, and in most cases very spiny grubs, apparently eleven-segmented when mature, and undergo two moults while within the body of the host, thus having at least three distinct larval stages. On leaving the animal they pupate within or upon the ground until the adult is ready to emerge.

The method of attack is varied, and three divisions have been suggested, roughly separating them into groups based on this character; the *gastric* which live in the alimentary canal, usually the stomach and duodenum, such as the various horse bot-flies, the *cephalic* which attack the nasal and pharyngeal cavities, such as the sheep bot-fly and the deer bot-flies, and the *cutaneous* which live in sacs which they form just beneath the skin, such as the ox warble, reindeer bot-fly and the squirrel, rabbit and rat bot-flies. As a rule, also, different genera of bot-flies parasitize normally certain closely related groups of mammals, either a single species, genus, family or order. Thus *Gastrophilus* affects the horse, *Hypoderma* the ox and buffalo, *Oestrus* the sheep, *Oedemagena* the reindeer and its congeners, *Cephenomyia* the deer and *Cuterebra* the various forms of rodents. While these different groups and genera have in the main similar life histories, there are peculiarities with every species, so here are individually considered in a brief and concise manner the essential facts regarding the appearance, life histories, injuries and methods of fighting these interesting though harassing creatures.

THE OX WARBLE FLY (*Hypoderma lineata* Villers).

Of all the bot-flies affecting domestic animals in this country the ox warble is the most injurious and causes the greatest losses to the farmer. Therefore, being the most important species, it will be considered first. Every farmer is familiar with the sores which come upon the backs of his cattle during the winter months, developing grubs therein which drop out in the spring, but very few indeed have an adequate conception of how these grubs came into place or what the mature insect to which

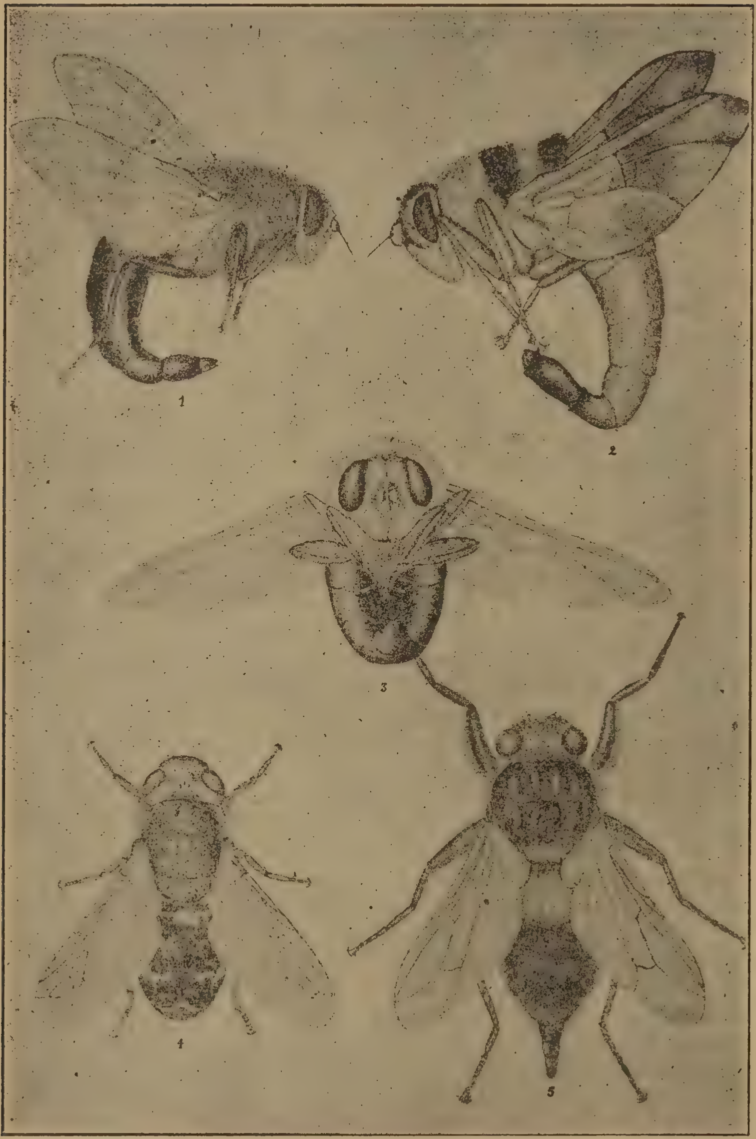


Fig. 25. Nebraska Bot-flies: 1, Chin Horse Bot-fly; 2, Common Bot-fly of the Horse; 3, Red-tailed Horse Bot-fly; 4, Sheep Bot-fly; 5, Ox Warble-fly. [Original.]

they will give rise really looks like. Indeed, the whole affair seems clouded in a sort of mystery.

It is interesting to know, then, that the warbles found in the backs of cattle in this country are all, so far as we now know, the larvae of a single species of bot-fly, the *Hypoderma lineata* of Villers, an insect usually known to farmers as the "warble fly," the "cattle bot-fly" or the "heel fly," the animals affected being said to be "warbled" or "grubby." The insect occurs throughout the United States wherever cattle are raised, and is common in Europe also, occuring there with a larger and differently colored species of similar habits, *Hypoderma bovis* DeGeer, which latter species may yet be found in America. Aside from infesting domestic cattle, in early days *lineata* was present among the herds of native bison or buffalo, but whether it was an original parasite of this species or one introduced from the domesticated animals is a question yet undetermined, although the probabilities lie with the latter alternative. At any rate it was always rare on the bison, even when abundant on the cattle. Whether it is indigenous to Europe or America or both is another unsettled problem, the evidence for a complete demonstration of either theory being lacking.

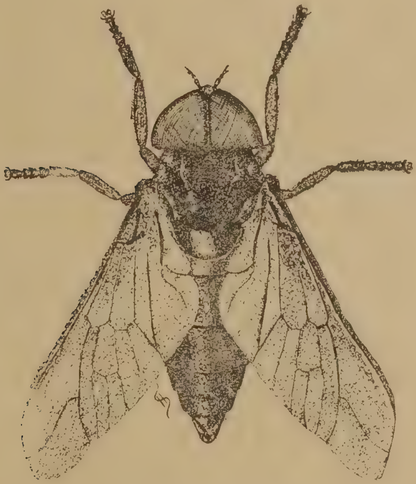


Fig. 26. The Black Gad-fly (*Tabanus atratus*).
[Original.]

In appearance the ox warble fly is dark and fuzzy, about one-half an inch long or slightly more, with the top of the head and thorax, middle of abdomen and legs clothed with blackish hair, relieved on the base of the abdomen, sides of thorax, and face with whitish pubescence, and having the abdomen tipped with orange. The thorax has four parallel raised lines from which the insect derives its specific name, *lineata*. The female is distinguishable by the long, slender, extensible ovipositor which may add one-eight of an inch to the total length when drawn out. Many farmers mistake the large black gad-fly, *Tabanus atratus*, an insect slightly over an inch long, jet black, with smoky wings, for the author of the warbles, but this impression is entirely erroneous. The presence of this insect upon the cattle's backs in summer is entirely for the purpose of sucking the animal's blood, an act which it is easily enabled to accomplish by use of its strong lance-like mouth parts, thereby inflicting a painful wound. This fly is a close relative of the well known "Greenhead," which is endowed with similar tormenting propensities, and the larval stages of both of these gad-flies are spent in the water or soft mud of lowlands. Hence to seriously consider this insect as connected with the warble injury would be ridiculous.

Owing to the persistent and often emphatic complaints coming from our farmers and stock raisers, detailing losses from injured hides, shortened milk supply, difficulties in fattening, a general emaciated condition of the badly infested cattle and not infrequently the death of calves, all due to the ravages of the warble fly, it was deemed advisable to take up the matter for consideration in this report. Accordingly, in order to determine as accurately as possible the general estimate of the harm this insect is really doing in Nebraska, the losses it is occasioning, and the remedies, if any, which were being used against it, numerous copies of a circular were sent out to prominent cattlemen and stock growers over the state, briefly outlining the known habits and history of the insect, and asking questions which were hoped to bring out such personal observations as had been made. These questions were as follows:

1. Is the Ox Warble present in your locality, and if so, to what extent?
2. How long since it was first known to occur there?
3. When do the grubs first appear on the cattle's backs?
4. When do they drop out?
5. In marketing animals, how much, if any, do the dealers dock on account of the presence of the grub?
6. Does the presence of warbles interfere with fattening, and if so, to what extent?
7. Are these grubs equally common on range and farm animals?
8. When do the flies first make their appearance?
9. On what part of the animal do they lay their eggs?
10. Do the cattle in your locality act afraid of the flies?
11. What is your opinion as to the method of the grubs in reaching their position on the animal's back?
12. How frequently, if ever, have you found grubs wandering through the body of a slaughtered animal?
13. What do you recommend as a remedy for cattle bots?
14. Does dipping for mange and lice reduce the number of warbles on cattle?

The general consensus of opinion as reflected in over one hundred replies to this circular may be briefly summed up thus:

1. The Ox Warble is present over the entire state, and while eastwardly it seems to be only fairly common, in western Nebraska it is abundant and of recent years has been decidedly on the increase. On the majority of ranches from 50 per cent to 75 per cent of the cattle are affected.

2. It has been present as long as cattle have been raised in the state, appearing with the first settlements; within the memory of many old settlers it has been prevalent among our cattle for the last forty years or more.

3. The first grubs appear as early as September, when a few very small ones are discernible upon close inspection, more appearing during October, November and December, and all reaching very obvious size by New Year's Day, from which time on they are conspicuous.

4. The first ones begin to drop out about the 10th of March, the bulk of them leave the animal during April and May, and practically all have dropped out by the 10th of June.

5. As a rule, there is no dockage on animals poor in flesh because of warble attack, but sometimes 5 per cent to 10 per cent of the value is docked for this cause; warbled hides, however, are *always* rated second class, which is equivalent to a dockage of one-third.

6. Where only a few grubs are present the interference with fattening is too slight for consideration, but badly infested animals fatten only with great difficulty or not at all, require 10 per cent more feed, and are usually about a month behind uninfested individuals, an interference in all of perhaps 25 per cent to 35 per cent.

7. Where the two are equally accessible to the flies, farm and range cattle seem to be equally infested, but westwardly the range cattle seem to have much the worst of it.

8. The first flies appear about the first of April, others coming out during May, June and July, reaching the maximum of abundance early in the season. The value of the answers to this questions were greatly lessened by the common confusion of *Tabanus atratus* with the real culprit; these answers of course invaribly gave the season as July and August.

9. The eggs are deposited on the lower portions of the limbs, usually the hind legs about the hoofs.

10. The cattle are everywhere afraid of the flies and try to escape from them by running or seeking water, where the fly will not follow.

11. Very few cattlemen have any definite notion of the *modus operandi* of the grubs in reaching their location in the animal's back. All those mistaking the *Tabanus* for the warble fly of course clung to the old idea of direct placement on or under the skin of the back.

12. Very few had found evidences of the grub elsewhere than in the

back of the animal. Mr. W. S. Raker has found them "along the oesophagus," while Mr. M. D. Cravath reported that a neighbor had found one "under a rib" in the spring.

13. The only remedies generally practiced are the squeezing out of the grubs or killing them by putting some substance, such as turpentine, carbolated oil, axle grease, etc., into their breathing holes in the animal's back.

14. Dipping, being practiced in the fall and early spring before the breathing holes are well formed, is considered usually ineffectual against warbles. Late spring dipping has, however, apparently proved helpful in some cases. Actual experimentive tests, which it has as yet been impracticable to make, seem necessary for the complete determination of this point.

With the aid of these letters, amply supplemented by published observations and personal notes, the writer now presents what is believed to be the complete and accurate life history of this insect. When the warbles begin to locate in the cattle's backs in September and October they are quite small, only two-fifths of an inch long, so that they would scarcely be evident except upon skinning the animal. They are then quite smooth except for minute, short, black, spiny hooks around the small breathing holes at the posterior end of the body. By the use of these spines, however, the larva slowly pierces the skin and brings the anal breathing pores to the air. When this is accomplished a moult is undergone and we get what is called the third larval stage of the insect, in which the body is finely spined on the ventral side and the breathing pores are much enlarged. The activity of the spiny larva at this stage causes an irritation and a resultant gathing of serum upon which the creature feeds and grows rapidly. This causes the greenish yellow, running surface to the skin and the adjacent tissues known familiarly as "licked beef." Another moult and the fourth and final larval stage is assumed, provided with its abundance of spines and its thick heavy body. By this time the New Year has come in, and the grubs have developed good-sized lumps which can readily be felt by running the hand along the animal's back. Each one is now encysted in a little sac and subsists upon an abundant accumulation of serum and pus. When growth has proceeded so far that the grubs are matured, having become an inch or more long and nearly one-half as wide, they work their way out of the breathing holes and drop to the earth, which they enter to the depth of one or two inches. This egress begins early in March and continues for about three months, as the larvae of various ages mature. They are at first grayish in color, but rapidly darken, contract, and harden, finally turning dark brown or blackish, thus forming the puparium. In three to six weeks the puparium is broken off at the anterior end and the adult bot-fly emerges. This emergence commences with the beginning of April and continues until July, there being adult flies abroad until early in the fall, though the life of each individual fly is but a matter of a few weeks.

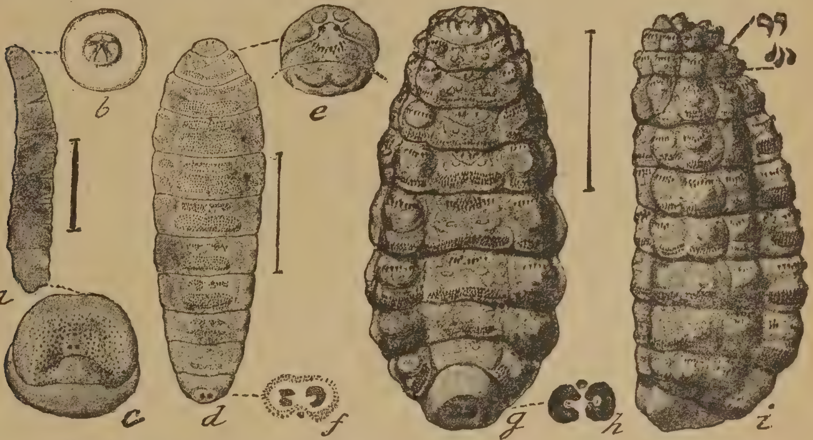


Fig. 27. The Ox Warble: *a*, second stage of larva from back; *b*, *c*, enlargement of extremities; *d*, ventral view of the third stage; *e*, *f*, details of the extremities; *g*, mature larva, dorsal view; *h*, anal spiracles enlarged; *i*, mature larva, side view. [From Insect Life.]

Soon after emergence the flies mate, after which the males are left idle and fancy-free while the females seek out a bunch of pasturing cattle and set about the more serious business of perpetuating their species. Swiftly approaching a grazing animal with her long, slender ovipositor fully extended and everything in readiness, an egg is quickly attached to the hairs of the legs, usually just above the hoofs in the region of the "heel," but sometimes higher up, even to the flanks or belly. Several are usually attached in a row upon the hair, and the structure of the egg is such that the attached end grasps tightly almost completely around the hair. The cattle have an instinctive terror for the fly, and in the presence of one become greatly excited, throwing up the tail and chasing madly for the nearest pool of water, into which they plunge, and thus escape from the harassing insect, which will not follow over water.

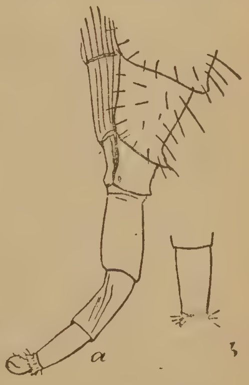


Fig. 28. Ovipositor of female Warble Fly. [From Insect Life.]

The eggs are elongate oval, yellowish white, about one twenty-fifth of an inch long, and even when laid contain young living larvae. When the animal licks the spot the eggs are taken into the mouth and the larva immediately escapes, or the pressure and moisture of the tongue splits the free end of the egg and the larva is taken up, leaving the empty shell behind. These newly hatched larvae (first stage) are a bit smaller than the egg, the cavity of which they just fill, and are thickly covered with minute spines, longer and curved on the end of the last

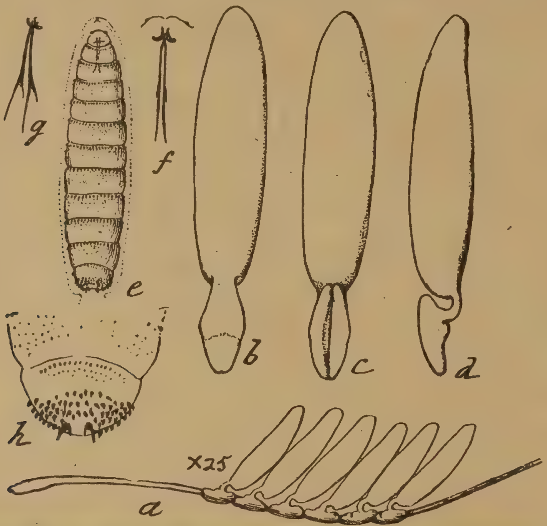


Fig. 29. Eggs of Warble Fly: *a*, eggs attached to hair; *b*, *c*, *d*, dorsal, ventral and lateral views of egg; *e*, first larval stage as seen in egg; *f*, *g*, mouth parts of same; *h*, anal segments of same. [From Insect Life.]

segment, and are provided with two mouth hooks mounted upon rods. They enter the oesophagus, slowly penetrate it by means of the body spines, anal end foremost, after which they moult their spiny coat and assume the smooth second larval stage already described. By February they have all left the oesophagus. After about a month of laborious wandering up through the connective tissues of the neck of the host they finally reach without further change their ultimate location beneath the skin of the back, the development then proceeding as already detailed.

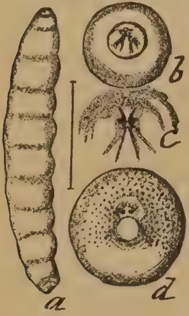


Fig. 30. Second stage of Ox Warble: *a*, larva taken from oesophagus; *b*, head segments; *c*, mouth parts; *d*, anal segments showing spiracles and spines. [From Insect Life.]

For the dairy herd or other small herds which receive considerable care, the methods of combating this pest are simple and sure, but for the range cattle, which really need help the most, we have as yet no thoroughly satisfactory remedy. The two feasible avenues of attack lie in preventing the deposition of eggs and in destroying the grubs while they are encysted in the cattle's back. In the first method, which because of the attendant labor and expense is serviceable only in small and well-kept herds, strongly odorous repellants are applied to the legs and flanks of the cattle, and serve to deter the fly from ovipositing thereon. For this purpose train oil or fish oil mixed with carbolic acid may be sprayed, or axle grease may be smeared over the parts, these applications to be repeated at frequent intervals from April to August. The second and more practicable method is to apply to the warbles once or twice during the winter and early spring some oil which will close the breathing holes of the grub and thus suffocate it. For this purpose the substances just mentioned as repellants may be used, or else kerosene or turpentine. The grub is killed immediately, and the wound soon closes and heals so that the hide is uninjured, and the animal being relieved from the constant irritation gains in flesh or in milk production. In many cases it is as easy to squeeze out the grub, and wherever this can be done the results are even better, provided the creature is crushed and not allowed to develop into a new fly. Inadequate and laborious as it may be, this destruction of the larvae while in the back is the most practicable method of control which has been suggested, even for range cattle.

THE HORSE BOT-FLIES (*Gastrophilus* spp.).

We have in this country three distinct species of bot-fly infesting the horse, all belonging to the genus *Gastrophilus*. The common horse bot-fly (*G. equi* Fabr.), is the one most often met with, and the writer has examined specimens from Crete, West Point, Glenville, Sidney, Harrison and other localities representing every section of the state. Almost equally prevalent is the chin bot-fly (*G. nasalis* L.) of which specimens from Lincoln, Culbertson, Crawford and one or two other localities now lie before him. The third species is known as the red-tailed bot-fly (*G. haemorrhoidalis* L.), a species comparatively rare in Nebraska, but apparently more common than *nasalis* in some parts of the United States.

All of these species differ in the finer details of appearance, attack and life history in their several stages, but yet in the main are so much alike as to justify their consideration together. In the adult the sexes are quite similar, but the females are distinguishable by the elongated tubular tip to the abdomen, this part being in the male blunt and provided with a pair of claspers. The three species can be readily told by the following table:

Wings clouded with a dusky crossband and tipped with two dusky dots, the anterior and posterior crossveins about equally distant from the tip; abdomen yellowish brown, more or less varied with dusky especially terminally; legs yellow, length about three-fifths of an inch ....*equi.*

Wings uniformily clear without clouded spaces; abdomen black, with its pubescence whitish at base, usually black medially, and whitish or orange at tips; legs brown or black.

  Posterior crossvein considerably nearer to the tip of the wing than is the anterior one; length two-fifths of an inch....*haemorrhoidalis.*

  Posterior and anterior crossveins about equally distant from the tip of the wing; length about three-fifths of an inch..............*nasalis.*

Adult bot-flies are most in evidence during the middle of the summer, *i. e.*, during July and August, but *nasalis* begins to appear in latter April and *equi* continues operations at least through the month of October, so that the entire period in which horse bot-flies are abroad covers six months or more. During the warmer portions of the day they buzz about among the horses in the pastures or follow them along the country roads, seeking to deposit their eggs upon the animal, or else they lie in wait upon some tall thistle or sunflower for the approach of a victim. The eggs are laid upon the hairs of the horse, and are glued there by a sticky liquid which dries and holds them on so securely that they can be removed only with difficulty. In oviposition, the female hovers with the abdomen bent under and its tip extending far forward, then suddenly darts to the animal, attaches the egg and retreats, to repeat the operation in a few moments. The various species select different portions of the body for this purpose; *equi* lays its eggs anywhere upon the hairs of the forelegs and shoulders that the horse may be able to reach and lick, while *nasalis* and *haemorrhoidalis* always deposit theirs upon the chin and about the nostrils and mouth. The presence of the bot-fly thus engaged apparently gives the horse much annoyance, and often frantic, but usually futile efforts are made to destroy or escape the pest. That such consternation is purely instinctive is shown by the fact that with its rudimentary mouth parts and soft, blunt ovipositor the fly is quite incapable of inflicting any pain.

These eggs are about one-twentieth of an inch long, cylindrical, finely ringed, the attached end rather pointed and the free end thicker and ending in an obliquely truncate cap. The eggs of *haemorrhoidalis* are easily distinguishable by their dusky color, those of *equi* and *nasalis* being whitish, but even these can be distinguished, for the eggs of *equi* are attached to the hair only about one-half of their length and the cap is larger and more oblique than in the eggs of *nasalis* which are attached nearly their entire length. Each female deposits easily four or five hundred eggs during her life.

It seems that moisture is necessary for the successful hatching of these eggs, and the great bulk of those out of reach of the animal's tongue probably fail to develop larvae. When deposited the eggs contain partially developed larvae which in the course of two or three weeks, or sooner if much licked, push off the terminal cap and escape, leaving behind the empty egg case. If not hatched with a month or five weeks the larvae die. Those which hatch are very active, and by crawling over the skin cause the horse to bite or lick the irritated spot and thus they gain entrance into the mouth. In the case of *nasalis* and *haemorrhoidalis* the larvae are within reach of the animal's tongue as soon as hatched, and are taken in almost immediately; moreover their eggs receive much more moisture than those of *equi* do, and hatch in a correspondingly shorter time, usually within a few days after deposition.

The young larva is a slender, elongated, transparent, thirteen segmented maggot, and possesses two large black mouth hooks by which it is enabled to migrate down the oesophagus of the horse and into its stomach, which it reaches in a few days, meanwhile undergoing a moult. By means of the oral hooks it attaches itself to the membranous lining of the stomach. There it soon undergoes a second moult and is then very spiny and quite changed in form, the head being narrowest and the posterior half of the body widest, while previously exactly the opposite was true. After the assumption of the third stage the grub is eleven segmented, and the three species may be easily distinguished by the arrangement of the armature, as is shown by the accompanying table:

Dorsal spines near sutures of somites 2-9 arranged in a single row, all large, dark and retrorse, the secondary smaller row wanting, the row broken medially on somite 9; broadening from somites 1-7, the first somite as broad as long; length 13-15 mm., width 6 mm. ....*nasalis*

Dorsal spines near basal sutures of somites 2-9 arranged in two alternating rows, broken medially on somite 9, absent on 10 and 11.

Spines of the two rows subequal, rather small; body broadening from somites 1-4, the first somite about as long as its posterior breadth; color dusky; length 13-16 mm., width 6 mm.......*haemorrhoidalis*

Spines of the second row similar to those of *haemorrhoidalis*, but those of the first row much larger and stronger, black; body broadening from somites 1-6, the first somite decidedly longer than its posterior breadth; color yellowish; length 18-20 mm., width 8 mm. ....*equi.*

The injury done by the bots is in this stage, and while ordinarily they do but little harm, their presence in numbers often is the cause of some very disagreeable conditions for the horse. They irritate the membranous lining, retard glandular activity, subsist upon exudations from the sores they create and upon the stomach contents, and interfere with the passage of food into the intestines. While these conditions rarely cause death they afford the animal much annoyance, and when several hundred are in the stomach at the same time, as sometimes occurs, they may become serious. The larvae of *equi* prefer to locate on the left side of the stomach, those of *nasalis* usually both there and in the duodenum near the pylorus, but *haemorrhoidalis* usually locates upon the right side of the stomach proper. This latter species often attaches itself in the throat about the pharynx when very young, and is then the cause of a distressing cough.

After spending several months in the alimentary canal of the host the larvae loosen their hold and pass out with the excrement to the ground. In the case of *haemorrhoidalis*, however, they re-attach themselves to the walls of the rectum and remain there for a time before leaving the animal, meanwhile changing color from reddish to dusky. On reaching the ground the larvae penetrate the soil to a slight depth, and within a few hours pupate, becoming shrunken, hard, and black. After four or five weeks in this condition the adult flies emerge.

In dealing with horse bots the doctrine that an ounce of prevention is worth a pound of cure is well exemplified. Certain it is that our most successful method of abating the evil is by destroying the eggs before they have had time to hatch. We have seen that in the case of *equi* two or three weeks intervene between the deposition and hatching of the eggs, and it follows that if they are removed or killed every two weeks during the summer they cannot gain entrance to the horse's mouth and infestation is prevented. With animals given plenty of attention there is no difficulty, for many of the eggs are removed in the daily currying or purposely by the discerning keeper, but with pasturing horses and colts which receive no such care, much trouble is often experienced. The eggs may be rapidly clipped off with a sharp razor or else may be killed with washes of carbolated water or kerosene. The latter, however, tends to remove the hair and for that reason is less desirable; the carbolated water should be prepared in the proportion of thirty parts of water to one of carbolic acid. Once the bots have entered the stomach they should ordinarily be left to remove themselves naturally. Various substances, but usually turpentine, intended to expel the grubs from the stomach have been advocated, but such treatment is attended with so

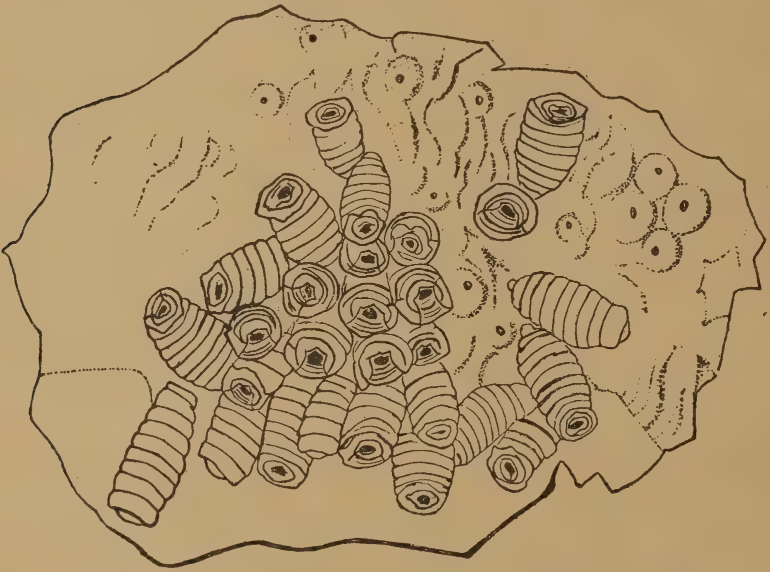


Fig 31. Bots attached to lining of stomach of horse. [After Curtis.]

much difficulty that it requires the services of a competent veterinarian and should be resorted to only in extreme cases. These bots are exceeding tenacious of life, possessing almost incredible resistance to applications quickly fatal to other larvae, and any efficient expurgative will likely be more injurious to the animal than are the bots themselves.

THE SHEEP BOT-FLY (*Oestrus ovis* Linnaeus).

The sheep bot-fly, as its name indicates, is an exclusive parasite of the domestic sheep, having been recognized as such even by the ancients. Its distribution practically coincides with that of its host, which renders it nearly cosmopolitan. Owing to the comparatively small number of sheep raised in this state, it is nowhere so common as are the species infesting the cow and the horse, but wherever sheep do occur it is usually present.

The adult sheep bot-fly is about a half inch or less long, the head and thorax yellowish, thickly studded with little embossed black dots and brown specks, the abdomen black very irregularly mottled with silvery, and the face yellowish white. On the bright hot days of summer and early fall (*i. e.*, June to September inclusive) they fly about the pasturing animals and deposit larvae in or about their nostrils. Immediately these larvae by means of minute spines work up the nostrils and nasal passages until they find lodgement in the frontal sinuses of the head, just above the eyes. Here they imbed their mouth hooks into the sensitive membrane which lines the cavity, feeding upon the mucus which their irritating presence engenders. At first they are very small, scarcely one-twelfth of an inch long, and glassy white with brown anal breathing pores, but as they grow they become reddish banded with dusky, and are supplied with many minute spines ventrally. After they have reached a length of about an inch they are full grown, when they loosen their attachment and leave the animal through the nose. Within a day

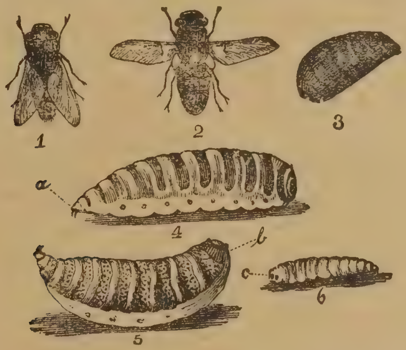


Fig. 32. The Sheep Bot-fly: 1, 2, adult fly; 3, pupa; 4, 5, full grown larvae; 6, young larva. [From Riley, 1st Missouri Report, p 161.]

they pupate and after about a month give forth the adult fly. The life cycle of each fly consumes about ten months.

The presence of these bot-fly larvae causes the affected sheep a great of suffering, and when they are numerous frequently leads to fatal results. There is a heavy discharge from the nose, accompanied by much sneezing, a shaking and lowering of the head, and frequent staggering. At times difficulty in breathing results from the many larvae, inflamed membranes and profuse discharges of the nose. In fatal cases the animal becomes very weak, refuses all food, and dies in convulsions within about a week. There have been as yet, however, no serious complaints of the harmfulness of this insect in this state. In this connection it may be of interest to make note of some

OTHER NORTH AMERICAN BOT-FLIES.

The bot-flies of the genus *Cephenomyia* are normally parasitic in their larval stages upon the various members of the *Cervidae* or deer family, although they have been known to stray to other animals and even to man. Their life history as known in Europe is essentially quite similar to that of the sheep bot-fly which we have just considered. The female in the early fall deposits living larvae in or about the nose of the victim, which immediately work their way backwards into the nasal cavity, engendering by their irritations a catarrh-like flow of the mucus upon which they subsist and slowly develop. About mid-winter they moult and the young larvae of the second stage leave the nasal cavity for the throat, where they occur with and ultimately transform into the larvae in the third stage, from which they differ mostly by being smaller, more slender and less spinous. They locate in the throat, upon the palate, in the eustachian tubes and about the base of the tongue, forming sores upon the secretions of which they complete development, when they leave the animal by passing out through the nose and mouth. Upon reaching the earth they pupate within a day or two in some dark, protected spot, the adults emerging in three to six weeks. Quite frequently, in cases of severe infestation, the grubs cause the death of the unfortunate animals, which are then said by hunters to have died from "grub in the head."

Cephenomyia is known in North America only in the larval stage, the adults never having been reared or even captured as far as we have a matter of record. Brauer in his admirable monograph mentions having received from Baron Osten Sacken larval specimens of what he thinks is *C. ulrichii* Brauer, collected in this country from the throat of the moose, *Alces alces*, and he also described, but wisely refrains from naming, an apparently new species of this genus based on two larvae taken from the throat of a Black-tailed Deer (*Odocoileus hemionius*) in the "Northwest Territory" by Thomas Say. The *Oestrus phobifer* of Clark, described from Georgia, has been doubtfully referred to this genus. More recently Riley and Howard (Insect Life, I, 386) record another species of

Cephenomyia apparently differing from either of the above, taken from a young deer (*Odocoileus* sp.) in Humboldt county, California, and a little later give an account (ibid., II., 116) of the taking of forty young grubs of this genus from the nose of a man at San Bernardino in the same state. The same authors also record (ibid., III, p. 161) the taking of larvae of this genus from the throat of hogs in West Virginia. Both of these latter instances must be regarded as exceptional.

Oedemagena tarandi is a bot-fly which infests the reindeer (*Rangifer lapponicus*) and probably other related species of native Caribou in the boreal regions of North America. It has been repeatedly recorded from Alaska. The fly closely resembles the species of *Hypoderma* in appearance and probably has a precisely similar life history. The adults fly in July and August.

About twenty-two species of the genus *Cuterebra* are known from North America, and at least three species, *abdominalis* Swenk, *fasciata* Swenk, and *cyanella* Jones, have been found in Nebraska. These are very large flies, about the size of a bumble bee, and habitually parasitize various rodents such as the squirrels (*Sciurus*), spermophiles (*Citellus*), rabbits (*Lepus*) and woodrats (*Neotoma*). They have frequently been reported affecting the domestic cat, having been found on the belly, back, neck and about the eyes of the animal, and have even been found affecting a certain species of turtle. Their life histories are obscure, and the harm they do economically is probably very small indeed.

THE CONTROL, DEVELOPMENT AND UTILIZATION OF THE MISSOURI RIVER AND ITS TRIBUTARIES.

THE CONTROL, DEVELOPMENT AND UTILIZATION OF THE MISSOURI RIVER AND ITS TRIBUTARIES.

REPORT OF A SYMPOSIUM HELD AT THE STATE UNIVERSITY, MAY 20, 1908.

The speakers at this conference were Professors Condra, Caldwell, Stout, Phillips, Bengtson, and Gov. George L. Sheldon, with Dean Charles E. Bessey presiding. The principal object of the meeting was to make known reliable information in regard to the Missouri river, concerning which there is widespread interest and in some instances a tendency to magnify the future possibilities of the river. This paper is an account of the conference. It gives some of the thoughts that were emphasized at the symposium, reciting the facts as they were given by those who have investigated the respective phases of the theme.

The subject, "Geographic Conditions in the Missouri River Basin," was discussed by Prof. G. E. Condra. Professor Bessey said, while introducing the first speaker and subject: "That a river is more than water flowing between visible banks. It includes the slopes over which or through which a sheet of water passes slowly or rapidly to a central stream. This drainage is essential to the open river."

GEOGRAPHIC CONDITIONS IN THE MISSOURI RIVER BASIN.

BY G. E. CONDRA,
Professor of Geography and Economic Geology, University of Nebraska.

MR. CHAIRMAN, LADIES AND GENTLEMEN: I will try to outline some of the factors which control the Missouri river. Dean Bessey, the father of science in Nebraska, has given us a good definition of a river. A great river is not the same in its various parts or courses. It is conditioned by many things, such as structure, topography, subsoil, rainfall, temperature and evaporation. The rate and volume of flow; the quality of water, whether turbid or clear; the source and direction of a stream; its quiet and rapid waters, low and high stages, these and other conditions are not accidents; they are readily accounted for by those who study the environments of rivers.

The drainage basin of the Missouri has an area of about 492,000 square miles, including all of Nebraska and much of Kansas, Iowa, South Dakota, North Dakota, Montana, Wyoming and Colorado. The principal tributaries from south to north are the Kansas, Platte, Niobrara, Cheyenne, Little Missouri, Yellowstone and Milk rivers. The trunk stream, known as the Missouri river proper, is formed in southwestern Montana by the union of the Jefferson, Madison and Gallatin rivers. This is known as the head of the Missouri; however, we should recognize the fact that the head waters of the river lie in all of its tributaries along the east front of the Rocky Mountains and even out on the plains, the sources being in many streams and at many places. The largest affluents join the main river on the right, *i. e.*, coming from the west over long slopes of the Great Plains, which slant down from an elevation of 5,000 to 6,000 feet along the east border of the Rocky Mountain region to an elevation of about 1,210 feet at the mouth of the Niobrara; 950 feet at the mouth of the Platte; 725 feet at the mouth of the Kansas river, and nearly 400 feet at the junction of the Missouri with the Mississippi.

Drainage in the mountain courses comes down from elevations of 10,000 feet and higher at places. Let me give an outline of certain conditions in the basin.

General Structure.—There are many kinds of rocks in the basin, some hard and resistant, others soft and easily eroded. The bed rock in the table lands and plains, consisting of clays, shales, sandstones and limestones, is plainly stratified, the beds lying in a nearly horizontal position. At most places the bed rock here is covered by subsoil. The line between the high plains and the mountains is marked by strata which dip out under the table lands. Going into the mountains one sees rocks and structures entirely unlike those just described. They are the granites and metamorphic rocks. In brief, it may be stated that each principal tributary flows over several geological formations and that the nature of the streams is controlled somewhat by the structure of these formations. Waterfalls, rapids, quiet courses and the size, form and depth of valleys are explained in part by structure.

Topography and Subsoil.—The Missouri river basin contains rugged mountains, cut by deep canyons; high table lands, smooth and eroded; bad land regions, covering several thousand square miles; sand hill areas, occupying more than 20,000 square miles; loess plains, smooth and dissected, fully 50,000 square miles; a large extent of the glacial plains; and wide areas where close-textured, Cretaceous clays lie near the surface. The run-off is not the same on any two of the above named areas. The rainfall of the sand hills nearly all goes to underground drainage and issues as springs which give permanent streams. The clayey subsoils and rough topographies give quick run-off, followed by dry stream beds. This condition is best illustrated in the bad lands of South Dakota, Montana, Wyoming and Nebraska. The loess of southern Nebraska and northern Kansas will catch and hold a heavy rainfall, at least until it becomes thoroughly moistened, after which its run-off is large, causing floods.

Rainfall and Evaporation.—The mean annual rainfall decreases from about 35 inches in Missouri to about 12 inches at places in Montana. It is slightly heavier in the mountains than on the high plains. The snowfall is greatest in the mountains and least in the southern part of the basin. The maximum rainfall on the plains is in the spring and early part of summer. Evaporation is thought to be greatest in the southern part of the basin, especially on the high plains, where the relative humidity is low. Named from west to east, the Missouri drainage occupies, according to some authors, sub-humid, arid, sub-humid and humid belts. The Platte river and the Missouri river proper flow across each of these belts and are very noticeably affected by the climatic conditions in each belt.

Forested Areas.—These are confined to the mountains and usually to those parts of the valleys which lie in the sub-humid and humid belts. The region of low rainfall is, as a rule, one of little or no tree growth. Some of the mountain ranges are covered on their sides with thick forest; others contain either thin stands or bare slopes. The run-off, for several reasons, is most permanent where there is a forest covering. It is in this connection, *i. e.*, in the making of the Platte and the Missouri more regular in flow, that Nebraskans should favor forestation wherever it is feasible. There is strong evidence to show that a large amount of the Missouri river basin was forested before the time of the advent of the Indian and white man into the region.

The Mountain Tributaries.—These head in the snow fields and forested slopes and receive an abundance of water in the springtime. They are small, and rapid, due to steep gradients. In many places the run-off of these streams continues throughout the year. The streams are used for power in the mountains and for irrigation on the plains. Some of these rivers are strong enough to find their way to the Missouri during the summer months; others dwindle under the dry air, exposing their sandy beds, only the underflow continuing down-valley.

Overloaded Rivers.—The Platte is the world's best example of a stream that has a heavier load of silt and sand than it can carry. It breaks down large bowlders in the mountains; rolls them along its channel, loosening the small pieces. The pebbles and fine grains are carried eastward, especially at flood stages. When the river decreases in volume from one cause or another the load is dropped at least for a time, adding to the river's thick bed of sand. These processes make a broad flood plain and cause the river to become wide and shallow, therefore unsuited for navigation. The Missouri is moderately loaded with clay and silt, brought to it mostly by the Yellowstone river and the bad-land streams, making the water turbid.

*Missouri River.**—The head-water streams, known as the Three Forks, are each about 90 or 100 feet wide at their junction in Montana. Here the elevation is 4,061 feet; the valley is narrow and deep and the waters are clear and swift, flowing over pebble beds. The valley continues narrow to Cascade, a distance of 158 miles, in which the river falls an average of 4.4 feet per mile. Between Cascade and Great Falls the valley width is from one to five miles; the river falls 1.18 feet per mile; a wide flood plain, meanders and sand bars occur along this course of the river. The altitude at Grand Forks, Montana, is 3,295 feet.

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* In this connection I am indebted to Mr. M. A. Bengtson for most of my data.

From Great Falls to Fort Benton, a distance of 45 miles, the altitude is reduced to 2,619.16 feet, or an average fall of 15.02 feet per mile. This stretch is by far the most rapid in the river. The stream flows in a canyon the greater part of the distance, has many long stretches of rapids, very little flood plain and few meanders. The rapids cease a few miles above Fort Benton and there the navigable Missouri begins. From Fort Benton to the junction of Hell creek, a distance of 281.8 miles, the valley is narrow, with practically no flood plain; the walls are steep and high. From Hell creek to the mouth of the Yellowstone river the valley has an average width of from two to four miles, a broad flood plain, and well-developed meanders begin at the mouth of Hell creek. The fall of the river from Fort Benton to Fort Buford, at the mouth of the Yellowstone river, is from an altitude of 2,619.16 feet to 1,859.85 feet in a distance of 527.4 miles, or an average of 1.44 feet per mile.

From Fort Buford, North Dakota, to Bismarck, the river falls from an altitude of 1,859.85 feet to 1,634.36 feet in a distance of 307.3 miles, which is an average of 0.73 foot per mile. The valley width varies from one to four miles, generally being about one and one-half to two miles. The channel is obstructed by numerous bars and islands; meanders are well developed, and cut banks are numerous but not of much significance. From Bismarck, North Dakota, to Chamberlain, South Dakota, the altitude is lowered to 1,324 feet in a distance of 382.6 miles, or an average of 0.81 foot per mile. The same characteristics of valley and flood plain predominate below Bismarck as above. The only unusual feature is the Great Bend above Chamberlain, where the river makes a big loop and, after flowing a channel distance of twenty-five miles, it comes back to within two miles of where it began its loop.

From Chamberlain to Running Water, South Dakota, the altitude falls to 1,207.66 feet in 127.3 miles, an average of 0.81 foot per mile. From Running Water to Yankton the distance is 43.6 miles and the altitude falls to 1,157 feet, an average of 1.16 feet per mile. The valley from Chamberlain to Yankton does not vary much in width, being generally from one to two miles wide, and the channel swings from one side to the other with marked regularity. The meander limit has evidently not been reached and the valley bears a good many indications of youth. The banks are being cut slowly at many points along the way, but not rapidly enough to jeopardize seriously the value of bottom lands. It is also to be noted that the grade of the river from its entrance into North Dakota to Yankton, South Dakota, shows great uniformity. It is then to be expected, as is the case, that the valley characteristics shall also be uniform.

From Yankton, South Dakota, to Sioux City, Iowa, the altitude drops from 1,157 feet to 1,109.93 feet in 86.2 miles, or an average fall of 0.546 foot per mile. Just below Yankton the valley width increases abruptly from about three miles to nearly eighteen miles. The stream throughout this distance is characterized by well-developed meanders, cut-offs, oxbow lakes, and prominent cut banks. The channel in some places has shifted more than a mile since 1891. This shifting has been attended by the destruction of valuable farms, and hardships upon certain towns. For instance, Vermilion, South Dakota, was formerly a river port, whereas now it is three miles inland. Ionia, Nebraska, was a prosperous country village, but now even the townsite has been washed away. Where the town formerly stood the river now flows, and only a solitary house remains. This house is located on the uplands and apparently safe from the ravages of the Missouri.

From Sioux City to Blair, Nebraska, the channel distance is 116 miles; the altitude lowers to 1,011.2 feet, an average fall of 0.85 foot per mile. From Blair to Omaha, a distance of 35.5 miles, the average fall is 1.0+ feet per mile. Between Sioux City and Omaha the flood plain varies in width from four to ten miles and the river does not strike the Iowa bluffs until Council Bluffs is reached. There the valley is much constricted, being less than five miles wide. From Omaha to Nebraska City the altitude lowers from 975.55 feet to 947.66 feet in 51.4 miles, an average fall of 0.54 foot per mile. From Nebraska City to Rulo the elevation changes from 947.66 feet to 864.54 feet in a distance of 70.7 miles, an average fall of 1.1 feet per mile. From Rulo, Nebraska to the mouth of the Missouri the distance is 537.5 miles and the total fall 448.18 feet, an average fall of 0.83 foot per mile.

It should be noted that the Missouri flows on alluvial land throughout much of its middle and lower courses. Only here and there does it strike bed rock at the cut-banks. The fall is far from uniform and the difference between high and low stages is marked, the maximum flow at the junction with the Mississippi being about twenty-eight times that of the minimum. Sandbars and snags are features throughout the river length. In Montana, the Dakotas and along most of the Nebraska border, the river is usually closed by ice during a part of the winter. The flood stages are two, in March or April and June or July.

We have reviewed some of the conditions in the basin. Now, for the purpose of placing before you certain problems which are to be handled by other speakers, let me ask the following questions:

1. Will the storing of flood water for power and irrigation purposes in the tributaries affect the flow of the trunk stream? Will this in any way tend to decrease the floods of the lower Mississippi?

2. What are the relations of the forest to run-off? Should Nebraska promote the forestation of the Rocky Mountains, if so, why? Should our state encourage tree planting on flood plains and on lands bordering the rivers?

3. To what extent has there been navigation on the Missouri? What conditions made it unsure and unprofitable?

4. Is there any possibility of bringing the Missouri under control for use in navigation and especially to prevent its destruction of Nebraska's best farm land?

Dean Bessey introduced the second speaker as follows: "History records with her stylus the achievements of men. She tells how they subdue deserts, thread forests, cross mountain barriers and bring into subjection the rivers by forcing them to carry cargoes and to yield up their power. Professor Caldwell will tell us some of the things that have occurred on the Missouri river."

EARLY NAVIGATION ON THE MISSOURI RIVER.

BY H. W. CALDWELL,

Head Professor of American History, University of Nebraska.

Perhaps the most important problem in modern civilization has to do with transportation.

Two hundred or even one hundred years ago there was relatively little importance in this question since each community lived largely to itself. In these modern days, however, the interchange of commodities has become a necessity. Each community calls to its assistance the activities of every other community. Take the dinner table of any well to do family. It will contain contributions from the eastern and western hemispheres; both north and south will be represented. The table may be made of wood from one land; the linen and the plate on the table may come from Mexico, France, Ireland, and distant Japan; the food will represent the products of home and distant lands; Cuba, Brazil, China, Germany, Hawaii and Italy may each contribute its share. Nebraska indeed produces only a small proportion of its supplies; on the other hand a less proportion of its products are consumed within its boundaries. For the world, therefore, this problem of transportation has become an essential one; for the United States it may be said to be the problem of problems. This means of intercourse, then, cannot be neglected by the citizen or statesman, and this is especially true here in Nebraska. The cost of transportation and the equality of service interest every one, and are the two chief ingredients of the problem.

In a way the cycle seems to be completing itself. At an earlier date the wagon road, together with some natural water routes, formed the chief means of travel and exchange. Then improved and increased water carriage was developed. Both these means were neglected on the advent of the railroad, and for a time it seemed as if neither dirt roads nor water ways were regarded as worth consideration. Today the automobile seems to have revived the good roads spirit, and the congestion of railroad traffic the demand for improved water ways. Doubtless these are to be supplements to the railroads rather than substitutes for them. But the revived interest is shown in water-ways conventions and in good road lectures. It is beginning to be recognized that water routes tend to equalize rates, as well as to control the rate itself. At points of natural congestion, the river or the lake may relieve the strain. At St. Louis, Pittsburg and Chicago river and lake aid in distribution, and lessen the congestion, as well as control the rates for bulky articles. Experience shows that bulky products, as coal down the Ohio, iron ore from Duluth and grain from Chicago may be transported to their destination at a mere fraction of the cost by land carriage. When conditions are at all favorable, therefore, careful study should be given to find out whether water routes may be developed.

The problem for Nebraska and this northwest, therefore, is to secure water competition, to relieve the congestion that comes from the enormous product of bulky articles in this plains region, if it is possible. Of course the only hope lies in the Missouri river and its chief tributaries. A brief study of the river and the commerce that in earlier days floated on its turbulent waters may be worthy of a few moments of our time.

Speaking as the historian it may be noted that the first time the Missouri river was seen by a white man was in 1673, when Marquette and Joliet saw its muddy flood pour into the Mississippi river. Some time between 1699 and 1705 the river was ascended for some hundreds of miles, but the exact date is somewhat uncertain. By 1724 it was fairly well mapped, but its upper course was first explored in 1738 by Verendrye.

Commerce on the Missouri was begun, of course, by the Indians in canoes. French trappers followed and soon began to use the cotton wood tree canoe, as the birch bark canoe was unfitted for service on this snaggy stream. Other early forms of boat used by white men were the perogue, the batteau, the mackinaw and the bull-boat. All of these forms were used by the fur traders especially, but continued to be used in later days for carrying supplies and provisions. The fur trade ended about 1845 and these types of boats practically passed away at that date. With the beginning of the 19th century the keel-boat, the chief means of river navigation for many years, began its career. Manuel Lisa was one of the first to employ it in the up-river trade. Lewis and Clark in 1804 ascended the river by its means, as did Pike in 1806. J. J. Astor in 1810 had a fleet of five of these boats. The means of propulsion was a rope, perhaps 300 yards long, with ten to twenty men on land to draw the boat up-stream; sails, poles and oars were also used as occasion or necessity might determine. Some of these keel boats were nearly a hundred feet in length, and capable of transporting many tons of freight. In 1819 the first steamboat entered the river, and from that time to 1830, occasional trips were made, with a gradually increasing number of boats in use. During the next decade regular lines of steamers, equipped with one engine, were placed in service on the river. However, the years 1850 to 1860 were the golden years of Missouri river commerce. In 1858, the best year of all, about sixty regular packet steamers were employed, and tramp steamers to the number of thirty or forty found service along the river. The value of the commerce was greater, at its best, from St. Louis north on the Missouri, than it was north of St. Louis on the Mississippi. Many of the steamers used at this time were handsome and well equipped. Some of the largest ones measured 240 feet in length, with forty-foot beam, and were capable of carrying 400 people and 500 tons of freight. They were then called "floating palaces." At Leavenworth in one year 306 steamers entered and cleared, while in 1859 at Sioux City some 312 vessels, with goods to the value of $1,250,000, entered in one season.

The decline began with the civil war, as the guerrilla made the service dangerous as well as unprofitable. For a time about the close of the war, the Montana mines caused a revival of river traffic, but it was of short duration, as the railroad trunk lines from the east began to touch the river. St. Joseph was reached in 1859, Omaha in 1867, Sioux City in 1868, and Bismarck in 1873. By the latter date the profits of river traffic were gone, and the vessels that continued in service did so largely as tramps, and because they were in existence. Many were snagged, others broken up, and the remainder transferred to other rivers. The last steamer to leave the upper river is variously reported; some say 1885, others 1890.

The possibility of restoring this traffic is problematical. The rates then were much greater than land rates today, so if it may be developed into a profitable commerce, it must be after new inventions and more scientific methods have been applied. The possibility is sufficiently enticing to call for a careful study; but it would be the height of folly to go it blind, and spend millions until the problem had been investigated by the unbiased scientist in all its phases. The problem of storage, power, and navigation must be considered as a whole and the solution reached only after investigation.

At the close of Professor Caldwell's address, the chairman said: "Flowing water represents power. Every flowing river can do work. It can generate electricity, run trolley cars and light our houses. It can lift a part of itself out upon the fields to water the thirsty plants. Occasionally the drainage area contains more flowing water than the central stream can carry away, and then the water floods the land. These surplus waters scour the soil, they destroy fences, bridges and buildings. They impoverish the soil and the owners of the soil. Professor Stout will tell us of the work done by the great river along the lines just outlined."

THE RELATIONS OF POWER AND IRRIGATION AT THE HEADWATERS OF THE MISSOURI TO FLOODS IN THE LOWER COURSES OF THE RIVER.

BY O. V. P. STOUT,
Head Professor of Civil Engineering, University of Nebraska.

Major Chittenden, of the Corps of Engineers of United States army, has said that in no portion of her works has Nature left so much to be done by the engineer to supplement her deficiencies as in the modification of the natural flow of streams. Major Chittenden has been stationed for many years on the Missouri river and is probably the most thorough student of that stream in all its aspects and relations that we know. It is, therefore, fair to assume that the Missouri river inspired the statement which has just been quoted.

So far as a river like the Missouri is concerned, its uses for which it is or can be made available, are agriculture, transportation and power. In addition to the studies and works necessary to develop these uses we have also to interest ourselves in the works that are necessary to insure life and property against the destructive tendencies of the great stream. So far as power and transportation and the prevention of the ravages of the river are concerned there is a single, simple condition which may be kept in view as the ideal which is to be approached as closely as practicable. This ideal is a condition of absolutely uniform flow in the channel at all points, and is an ideal which is, in this case, as far removed from the actual as can well be imagined, for the Missouri river is subject throughout its course to extremes of high and low water. If absolute uniformity in the flow could be obtained all power developments would be able to deliver the constant output which is desired. The craft engaged in transportation would have a single and well known set of conditions to encounter, and the river, in due course of time, would settle itself into a regular and permanent bed, and the shifting and change which is now so prominent a feature would disappear. When, however, we consider the application of the water of the river to agricultural uses we find that absolute uniformity of flow is not consistent with complete utilization, since the demand for water for irrigation is a variable one even throughout the irrigation season, and ceases entirely during a large portion of the year. It is to be remembered also that it withdraws or diverts the water from the channel of the river, and that a large proportion, probably about two-thirds, is permanently withdrawn, given off by evaporation from the surface of the irrigated fields and crops. This is borne away in the upper currents of the air so that there is no assurance or ground for belief that when it does return to the land it will fall on the drainage area from which it was originally withdrawn. The other one-third of the water which has been diverted for irrigation will sink into the ground and in the form of return and seepage waters will sooner or later reappear in the main stream. It is easy to see that this action would interfere with any scheme or plan which aims to bring about a uniform rate of flow in the river.

However, even though irrigation would be a distributing factor in a scheme which contemplated a constant rate of flow in a stream, it is of itself an effective means toward the reduction of the extremes in the flow of streams. The features responsible for this effect being the storage of flood waters, which reduces the highwater stages, and the return of the seepage waters which augments the low water stages.

The discussion of the storage of water in connection with the utilization of streams for irrigation, power, and transportation has appealed chiefly to those who in some degree have been interested in these industries. The storage of water as a measure of protection against floods, however, has seemed to attract popular interest and as is usual in such cases, some mistaken ideas are entertained. The matter has been the subject of investigation in this country at various times for the last fifty or sixty years, and the conclusion generally has been the equivalent of that which Major Chittenden has formulated, "The function of reservoirs will always be primarily the promotion of industrial ends; secondarily only, a possible amelioration of flood conditions in the rivers." An illustration which seems to apply in this connection is that of the large reservoirs on the head waters of the Mississippi river. Experience has shown that these reservoirs are substantially effective in improving the navigation conditions on the upper Mississippi river down as far as St. Paul and that water power developments along the same stretch of river also are indebted to these reservoirs for an increased steadiness of flow. So far as flood conditions, however, are concerned, it is said that the effect of these reservoirs on the stage at St. Paul is inappreciable. This fact should not occasion surprise when it is remembered that although these reservoirs are among the largest in the world and store entirely the water drained from an area which is in itself large, this area is only a little more than ten per cent of the area drained by the river above St. Paul, so that a little less than ninety per cent of the area which was originally available to produce floods at St. Paul still remains effective to that end.

When we come to consider the regulation of the rate of flow in the Missouri river, by means of reservoirs at its head waters, we are confronted by some facts of history and experience which convince us that such an expedient can be only in part effective. Thus in the great flood of 1844 which has never, within the period of record been equalled on the Missouri river at Kansas City nor on the Mississippi river at St. Louis, low water was reported at Sioux City, showing that this flood owed none of its intensity to waters which came down from the mountain drainage areas at the head of the river and that reservoirs in that region could not have served to mitigate the flood.

The United States Reclamation Service, which has been in existence since 1902, has surveyed, estimated and in part constructed reservoirs for irrigation on the Missouri river catchment area, to the extent of an aggregate capacity exceeding four million acre feet. Four million acre feet is the equivalent of about 60,000 cubic feet per second for one month, or of 20,000 cubic feet per second for three months. The first of these amounts withdrawn from the Missouri river is sufficient to reduce materially the height of the June rise and the second is sufficient, if permitted to be applied to that use, to raise materially the height of the low stage in the river. Major Chittenden has estimated that the stage of the upper flood waters might reduce the flood height at Sioux City to an extent of from three to six feet, according to how completely the work of reservoir construction was carried out. A five year record at Sioux City shows the range in height of river there to be about twenty-two feet. Six feet taken off at the flood height, and an equal amount added to the low stage would reduce the extreme range in height from twenty-two feet to ten feet, which reduction would be a long step in the direction of securing the uniformity of flow which is so desirable from the standpoints which have been mentioned.

An idea which seems to be very generally prevalent is that the floods in the Missouri river are, to a large extent, responsible for the destructive high waters which occur on the lower Mississippi river. The most casual study of the records, however, will show that this is not the case. The high floods in the lower Mississippi correspond closely in point of time to those in the Ohio river, and occur several weeks earlier in each year than the flood in the Missouri river. The Missouri river flood is much smaller in volume than the Ohio river flood and is superposed on the Mississippi waters at a time when the Ohio and the upper Mississippi are in moderate flood at most.

The question of storge of the waters in the upper Ohio and its tributaries was discussed extensively about the middle of the last century, and the conclusion seems to have been that such storage if carried out to an extent to make it effective was impractical on account of magnitude and cost. The subject, however, has been lately reviewed by the Chief Hydrographer of the United States Geological Survey, who has had the advantage of a large amount of topographic and hydrographic data in addition to which was available in connection with the investigations of earlier engineers, and the modern view-point also has been modified by the developments in electrical transmission of power, and by the recognized desirability of conserving our coal supply. The conclusion reached in this later investigation, although advanced as a somewhat tentative one, is that the storage of water on the upper Ohio and its tributaries, costing from one hundred and twenty-five million to two hundred million dollars, would be repaid by the returns from power development alone; that the advantages to navigation would be material and pronounced, and that an effective measure of flood protection would be secured. It is not believed that this case can be taken as the basis for assuming that a similar investigation on the Missouri river would lead to a similar conclusion. As previously noted, the largest flood on the Missouri did not originate in a region where reservior sites can be found.

The Missouri River Commission which was in existence from 1884 to 1902 spent about nine and one-half million dollars on works of regulation and protection in the river, about two million dollars of this amount being spent above Sioux City, and the balance between Sioux City and the mouth. The expenditure of this large sum of money accomplished little for the benefit of navigation, since for this purpose the work must be systematic and continuous. The chief benefit which has been derived was in the nature of protection to private property, and even in this respect the demands for protection have been many times greater than could possibly be accommodated with the means at hand. This work, which has consisted largely of bank protection and similar construction, lacks the general utility which attaches to reservoir construction. If a reservoir is constructed and used intelligently it is known absolutely that flood heights will be reduced, low water stages will be raised, navigation conditions will be improved, the value and availability of the stream for power development will be increased, and riparian property will be more secure. There can be no doubt as to the direction of these effects. As to the measure of the effects in any given case there may be a wide range of uncertainty and difference of opinion.

In the introduction of the fourth speaker, the chairman said: "Every river has relation to forests. Where there are forests there are rivers; where there are no forests there are no rivers, the only possible exception being in the sand hill areas. When man wholly destroys the forests, the rivers disappear. In place of the stream is a dry river bed, abandoned as a continuous river course. It may carry as much water in a year as a river, but its flow comes as a sudden down-rush which soon leaves all dry again. In a real river it is not so; the water slowly oozing from the damp, forest covered soil, is constantly renewed. It is a living stream, not a fitful flood. The river margin favors the growth of trees. Soon the stream becomes fringed with a forest belt, which, if not destroyed, broadens out over the drainage area. When this is accomplished, the steady flow of the river is increased. *Give me the time and the means* and I can make the Platte a navigable stream all the year around! We will now ask Professor Phillips to discuss the subject which interests him most."

THE RELATIONS OF FORESTS TO RUN-OFF WATER.

BY F. J. PHILLIPS,

Professor of Forestry, University of Nebraska.

Mr. Chairman, Ladies and Gentlemen: The relation of forests in conserving water supply is an exceedingly important one. There is scarcely an old resident who has seen forests disappear but has also noted a marked increase in floods and the serious damage which results. On the other hand, where a nation has re-established protective forests on steep slopes and secured far-reaching, beneficial results, as France has done, it should be a strong object lesson to every nation where there is need for similar work. The general laws pertaining to the growth of forest trees and those relating to rainfall and stream flow are everywhere the same and what several nations have already learned by cruel experience ought to be an object lesson to the younger nations which are concerned with the same problems.

In our own country no waterway is so important as the Missouri-Mississippi and certainly in no part of this continent does the run-off reach such a maximum or produce such devastating results as it does along this stream course. Muir appropriately describes the situation when he says, "Think of this mighty stream, springing in the first place from the sea, flying on the wind, alighting on the mountains in hail and snow and rain, lingering in many a fountain feeding the trees and grass; then gathering its scattered waters, gliding from its noble lake, and going back home to the sea, singing all the way! On it sweeps through the gates of the mountains, across the vast prairies and plains, through many a wild, gloomy forest, cane-brake, and sunny savanna; from glaciers and snow banks and pine woods to the warm groves of magnolia and palm; geysers dancing at its head, keeping time with the sea waves at its mouth; roaring and gray in rapids, booming in broad, bossy falls, murmuring, gleaming in long, silvery reaches, swaying now hither, now thither, whirling, bending in huge doubling, eddying folds, serene, majestic, ungovernable, overflowing all its metes and bounds, frightening the dwellers upon its banks; building, wasting, uprooting, planting; engulfing old islands and making new ones, taking away fields and towns as if in sport, carrying canoes and ships of commerce in the midst of its spoils and drift, fertilizing the continent as one vast farm." Truly, this magnificent waterway demands our most serious consideration and our engineers and scientists should unite in trying to make it the best controlled stream of its size on earth as well as making the work serve as a model for smaller streams.

Conditions such as prevail at the headwaters of the Missouri show the value of maintaining a dense forest cover. The general elevation of the region is between 8,000 and 9,000 feet. Sudden, heavy rainfall is common during the summer. Snow comes early in winter and piles up to housetop depths before spring. Slopes are steep and were it not for some of the best forests that occur in the Rocky mountains every foot of slope soil would be washed away in less than a decade. It is well that the government controls most of these forests and that adequate provision will be made not only to maintain these forests but to actually improve them. The proximity of this work to the state of Nebraska and the great importance of the river to the state make it imperative that some consideration be given to the specific effect which a forest has in regulating the water supply.

A brief statement of the effect of the forest may be made as follows:

1. It has often been argued that the forest increases the rainfall. Most of the scientific investigators have found that forests do not increase the rainfall and only one or two men contend that the forests do increase rainfall. It is a generally accepted truth that the forests do not increase rainfall.

2. Forest trees do intercept a considerable portion of the rainfall on its way to the ground, thus allowing more time for the water to sink into the slope soils than would be the case if the slopes were bare.

3. The bases of standing trees together with decaying vegetation and other ground litter have a barrier effect which aids in preventing surface run-off on slope land. The greatest importance of this is manifested when comparison is made between a forest from which the litter has been burned and one in which the litter forms a perfect ground cover.

4. Forest litter and a dense humus serve as a great natural reservoir, which is much more retentive of moisture than bare soil would be. This decaying vegetation absorbs water quickly and has an immense capacity for holding it, and hence this factor serves as an effective check against flooding in mountain regions. Often the erosive effect of a torrential rain of more than four inches will be entirely prevented by forest humus.

5. A forest-covered slope has a more porous soil than a bare slope or one covered with grass and hence the soil proper is more capable of water absorption than would be the case if the soil were bare.

6. Forest-covered slopes constantly increase in soil depth and thus in water-holding capacity, while bare slopes rapidly lose soil and soon become incapable of retaining water. It has often been noted that in the United States, slope soil which has been forming for centuries was entirely washed away in the short course of three to five years after the complete removal of the forest. If we retain the forest under the proper management it will serve as a permanent resource which will give an annual yield of wood; destroy the forest and it may take centuries of time to re-establish a satisfactory cover.

7. The forest soil sends much more snow water to the water table than does bare soil, since the snow melts much more slowly in the forest than in the open. This is due largely to the shade furnished by the tree crowns, but is also due to a limited extent to the lessened evaporative force of the wind. The average temperature of the forest soil is 2° to 3° (Centigrade) lower than bare soil, which has an effect equal to about the same number of degrees in latitude for the bare soil. The importance of this temperature effect is shown by the fact that snow-fed streams flow approximately twice as much during the day as at night, hence an average difference of 2° to 3° must have an appreciable influence in the annual run-off.

Briefly, then, the value of forest cover lies in the greatly increased amount of water which is sent to the water table instead of becoming surface run-off, thus effectually regulating flow whenever the forest cover is in sufficient proportion to the size of the watershed. It serves, too, in retaining flow during early spring, when there is least need for the water and making available more water for summer, when there is greatest need for it.

Unfortunately, we have not had a sufficient amount of scientific study in this country on the changes which result in deforesting a water-shed which has been previously densely forested. The government has, however, made scientific comparisons between two adjoining water-sheds which were as closely similar as was possible to select. This comparison brought out many strong facts in favor of retaining the forest cover on slope lands, yet the results were not as striking as they would have been had they been tried on a water-shed which was densely forested and then had the forest removed.

The question has probably been most thoroughly worked out in France where two-thirds of all the torrents of Europe occur. During the French Revolutión immense slope areas were entirely denuded of forest growth and at least 800,000 acres of agricultural land was washed away or seriously affected by flooding. The danger was becoming worse each year and fully 1,500 streams were considered dangerous. The first policy for flood prevention was a vast system of reservoirs and dams. Then sodding the slopes was tried and finally recourse had to be made to reforestation. This method was effectually started under national laws in 1882 and alreads 163 of these torrential streams are under full control, while nearly 700 of the remainder are beginning to show the beneficial influence of reforestation. The difficulties of the work can be fully comprehended only when it is understood that it was sometimes necessary for the tree planters to carry soil up the slopes in baskets in order to make a suitable bed for the trees to grow in.

Another phase of protective work is of vital significance to Nebraska. There is a vast area of slope land within our state which is not perfectly suited for agriculture yet and which is well adapted for forest growth. The relative value of keeping these slopes tilled, in sod and in forest is fairly well shown by Professor Shaler, who says: "As soon as the tilled soil is moistened, each raindrop acts to break up the clods, bringing the material into the condition of mud, in which it is readily borne away by the rills, which, if the shower be heavy, quickly form in such numbers as to interlace the surface. In a few moments these little streams, at first obscure, gather into distinct rills, which, with quickly-swinging curves, carve out a model of a new drainage system. In the course of an hour a very rapid downfall on a bare, plowed field, with a declivity of not more than five feet in a hundred or less than the average slope of land, may have an average of one-third of an inch of its surface soil removed to the channels of a stream which drains it."

"A brief comparison of the effects of a heavy rainfall on a newly-tilled surface, bare of vegetation, and on a like area which is protected by the natural covering of living and dead plants will show the peculiar influence of the vegetable shield on the history of soils. On wood and grass lands the rainfall has practically no erosive effect whatever. In the forest the matter of decayed vegetation is in most cases able to take in three or four inches of water, which it yields up so slowly as to distribute the flow over weeks and in such a manner that it removes not a bit of soil." There is, however, a great distinction in sod and forest land, since a well-matted sod land has a large run-off, while the proper forest cover has a minimum run-off. This rapid run-off and lack of erosion on sod land is due to the surface mat of roots characteristic of the grasses, and while grasses may prevent erosion, the sodding of slopes may augment floods.

Still another phase of forestation should be tried extensively on the river-bank and flood-plane areas within our state. France and Russia have made provision for forestry work on the banks of streams which flow through regions quite similar to our own, and it is a well-known fact that there is no soil binder which compares in efficiency with forest growth. This type of land is capable of producing high-class forest growth and may be capable of yielding a considerable supply of timber if great care will be taken in selecting only mature timber. Since the amount of tree growth depends very largely on the amount of soil moisture, it becomes readily apparent that these areas would support some of the best stands of timber that could be found in the state.

In conclusion, then, it may be stated that no phase of water-shed protection demands more serious consideration than does forest growth. If our forests are rightly managed, there is no doubt that they will still serve a very high protective function and may even supply a considerable amount of wood. Destroy our protection forests and the entire gain from harvesting all of the timber on any great water-shed may be entirely offset by the damages of a single flood, while each recurring flood is bound to grow proportionately more serious. The most progressive of European nations maintain the strictest vigilance over their protective forests; and what Germany, France, Austria and Switzerland can do, with good results, certainly can be done in this country, with equally good or even better results. Our protection should not only concern the mountain states but also those which adjoin them on all sides, and since the increased future development of almost the entire Rocky mountain region depends upon water and timber, the question is one vital to our best welfare. We should stand strongly for forest protection and forestation in the mountains and for an extension of forest areas in Nebraska.

The chairman in presenting the next speaker said: "Streams, like children, are apt to form bad habits. They meander and, in doing so, get into trouble, and, what is worse, they make trouble for others. Professer Bengtson, who has studied these bad habits of the Missouri, will tell us about them."

MEANDERS OF THE MISSOURI RIVER AND THEIR EFFECTS.*

BY N. A. BENGTSON,

Instructor in Geography, University of Nebraska.

Mr. Chairman, Ladies and Gentlemen: I will briefly describe the meanders as they occur along the Nebraska border. Dr. Condra gave you a picture of geographic conditions in the basin and Professor Caldwell has reviewed the history of the early utilization of the river. My remarks are to be illustrated with about twenty lantern slides.

The "treacherous Missouri" is an expression common to people in the Missouri valley. The expression was originally applied by the steamboat pilots in the days when river transportation was a prominent industry. It was prompted by the fact that the channel in most of its course is in a bed of fine sand and therefore suffers frequent change of exact location. Recently a new meaning has been given, bearing more upon the relation existing between the river and its flood plain. The truth of the expression now may be questioned. Popular writers are wont to picture the Missouri river as a stream whose course is uncertain, and that a town on its banks today may tomorrow be several miles inland. While it is true that it has a shifting channel, and sometimes forms cut-offs, these are merely minor incidents in its work. The "cut-banks" are the results of meanders, whose laws of progress have long ago been stated and discussed at length by Professors Davis, Russell, and others. But inasmuch as the rate at which meanders progress varies with different streams and with different parts of the same stream, attempts to forecast the course of the Missouri have frequently proven disastrous.

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* This paper is a part of Mr. Bengtson's second degree thesis, which was prepared under the direction of Dr. G. E. Condra and presented to the Department of Geography, the University of Nebraska, May 15, 1908.

The Missouri river is corrading its banks to a greater or less degree along nearly its entire course bordering Nebraska. Commercially speaking, the cutting is generally slow and takes place only during the flood seasons. At periods of low water the banks are protected by the talus formed of surface material, which slides down by wind and water action. This material is generally fine silt, which in water becomes very compact and hence protects the coarser and more sandy layers at the water's edge. The bank of the stream opposite the cut-bank is almost invariably aggrading, forming a sand bar, or shingle bank. We should therefore not forget that the work of the stream is of two kinds, erosion and deposition, both about equal.

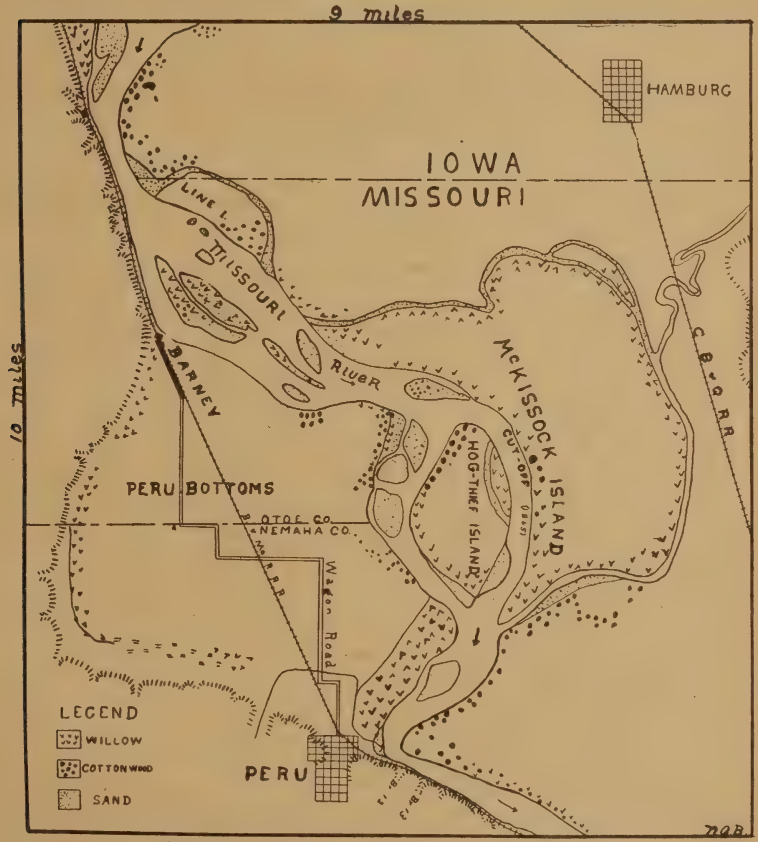
The Missouri river above Yankton, South Dakota, has a comparatively narrow valley, its flood plain being generally less than a mile wide. The course of the stream is characterized by long swings, striking the banks along either side alternately at distances of about four to eight miles. In that part of the course the meander limit has not been reached, and hence the progress of the meanders is affected by the escarpments bordering the flood-plain. Where this is the case the channel of the stream does not shift abruptly, as the records show but little change in the course of thirty years. At the South Dakota-Nebraska line only a slight change has taken place since 1881, the date of the first accurate data available. At but one place above the mouth of the Niobrara river has the channel changed its position in the flood plain more than forty rods within the time stated. At Niobrara the valley widens. From there to Yankton its width is from two to three miles, and with the wider floodplain channel migration becomes more marked. On the Nebraska side of the front of the first meander below Niobrara a strip of floodplain three miles long and averaging one-eighth mile in width has been cut away since 1882. The land has not been flooded within this time and is generally about six to eight feeet above flood waters. This bank, which is opposite Springfield, South Dakota, and just west of Santee Agency, Knox county, Nebraska, is the first important cut-bank along the Missouri river in Nebraska. The cutting there cannot become very rapid in the near future because of the influence of the direction of the bluffs. Where the river leaves the Nebraska escarpment and swings toward Springfield, South Dakota, the direction of the bluffs changes from north 25° east to north 37° east. The bend thus formed serves as a spur which deflects the stream and will prevent in large part very rapid cutting of the floodplain west of Santee Agency. The South Dakota floodplain south of Bon Homme and the first two Nebraska floodplains east of Santee Agency are not as favorably situated. The directions of the bluffs are such that rather violent cutting will continue on the upstream sides of the floodplain and the rapid addition of accretion land on the downstream sides. The first Nebraska floodplain east of Santee Agency has had about 800 acres cut away from its west side since 1882 and rapid cutting is still in progress. On the east side of the floodplain building is going on at nearly the same rate, but the accretion land has no commercial value for many years after its formation on account of the danger from floods. The accretion land is gradually built up, however, first by deposition of silt from flood waters, later by deposits due to wind action. The willow growths which spring up about the third year after the formation of the accretion land bear a vital relation to wind deposits. The willows grow very dense and hence when the wind blows from sand bars or cultivated fields over the willow thickets its velocity is checked and much of its suspended dust and sand is deposited. Thus in the course of a comparatively short time floodplain deposits may be elevated above the altitude of the flood stage of the river. When that point is reached other trees prosper, such as the elm, cottonwood, and some oaks. This stage of heavy timber may be noted as the third stage in development of accretion lands for industrial uses. The forest stage is generally followed by man's activities. The forests are removed and the land reclaimed for agricultural purposes. The floodplain north of Herrick, Knox county, Nebraska, has also suffered considerable cutting since 1881. But cutting is not now very rapid because the stream strikes the bluff above Herrick almost at right angles and hence is deflected back at an angle almost equally sharp. Cutting under these conditions will proceed in proportion to the normal progress of the meander. That progress, judged by human standards, is necessarily slow and in consequence does not threaten seriously the land values.

Just east of Yankton the valley widens abruptly, from there to Sioux City averaging from ten to seventeen miles. The river between these cities nowhere touches the South Dakota escarpment while it strikes the Nebraska bluffs seven times. The course in this wide floodplain is characterized by more abrupt curves and these generally swing against the comparatively loose materials of the floodplain. At Sioux City the river makes a 90° turn in its course, coming in from the west, and its course below the city is due south. That these conditions, wide floodplain and abrupt change in the direction of the river, have a direct relation to development of meanders cannot be doubted. Above Yankton the meanders are nearly symmetrical. The downstream portion of the loop is about equal and similar to the upper. Below Yankton the upstream part of the meander is generally much longer and makes a smaller angle with the mean stream direction than the lower part. This is clearly shown by every meander between Yankton and Sioux City. Below Yankton the river first strikes the Nebraska bluff near St. Helena. The mean direction of the stream is east 28° south, distance twelve miles. For the first ten miles the river is nearly straight, flows east 8° south, then turns sharply and now flows south 10° west. Thus in the upper part of the meander the angle with the mean stream direction is 20° while in the lower part it is 72°. There are no cut banks of any consequence in the upper stretch, very little change having occurred since 1892, so that for industrial purposes the floodplain may be said to be safe. In the lower course of the meander the position of the channel has shifted from one-fourth to one and one-half miles. In 1892 the river struck the bank one-half mile northwest of St. Helena, now it first touches it nearly a mile southeast. About six hundred acres have been cut away from the South Dakota floodplain and very nearly the same area added to the Nebraska side since 1892. The shifting at St. Helena since 1881 has been almost two miles. The land cut away was relatively high, well-drained, very fertile, and ranked with the best soil in the United States in productiveness. The accretion land is low, sandy, poorly drained, produces at present only rushes and willows, but may eventually become good farm land. For this generation and probably the next the loss is greater than the gain.

The same type of change has occurred below St. Helena at Vermillion Ferry, Ionia, Ponca Landing and near the mouth of Aowa Creek. At Vermillion Ferry the stream has shifted its postion one and one-fourth miles, and at Ionia about one mile since 1882. At Ponca Landing and Aowa Creek the changes have not been quite as marked, but the difference is of degree not of type. The strikingly rapid work has all been on the front of the short, sharp curves of the meanders while on the longer stretches the erosion has at no place exceeded one-eighth as much, and in many places no important changes have occurred. It seems true that the direction of the stream and the wide floodplain cause the meanders to have a long upstream course of gentle curve and a short downstream course at a sharp angle to the mean direction of the stream. In the long sweep of the meander cutting is slow for a greater distance; in the short swing the cutting is intense for a short distance. The total results measured in acreage eroded or areas aggraded are probably nearly equal. The cutting on the front of the sharp curve bears the more vital relation to man because of its relative rapidity and the short span of human life. The direction of the bluff in relation to the floodplain and the angle at which the stream strikes the bluffs are also factors whose importance should be emphasized. These relations are deserving of very careful study, and should immediately be made the basis of extensive research on the part of the state and federal governments.

The control exercised by the direction of the bluffs in relation to the stream course is well illustrated in many places, and especially so at Blackbird Hill, Decatur, Florence, Bellevue, Plattsmouth, Nebraska City and Peru. Space forbids detailed discussion of conditions at each of these places but the last two named stand as typical examples. The direction of the bluffs north of Nebraska City has an influence over the direction of the stream that bears a vital industrial relation. In the lower part of Copeland's Bend the direction of the bluff changes from east 28° south to east 40° south, then its direction changes so that in the north part of Nebraska City the direction is south 20° east. The stream follows the concave face of the bluff and hence at its turn is deflected toward the Iowa floodplain, striking it about one-half mile north of the Burlington railroad bridge. This causes a cut bank against the floodplain and a tendency to build a bar next the Nebraska side. If not checked this would mean a shifting of the channel to the eastward with its attendant sequels. A sandbar would be built under the bridge, the railroad grade to the eastward would be cut away and the bridge would be left a useless structure, spanning only an area of accretion land. To overcome this tendency the Burlington railroad company is compelled to protect the floodplain above the bridge from being cut. Hence extensive riprap work has been resorted to, but the force of the stream is such that this work must be kept up continually at great expense. Constant vigilance is necessary for breaks in the riprap must be attended to promptly. The cause of this condition is not the erratic Missouri, but rather an expression of the influence of bluff direction upon the consequent course of the stream. The work of the Burlington in its efforts to save its bridge also protects a large portion of the floodplain from encroachment by the river.

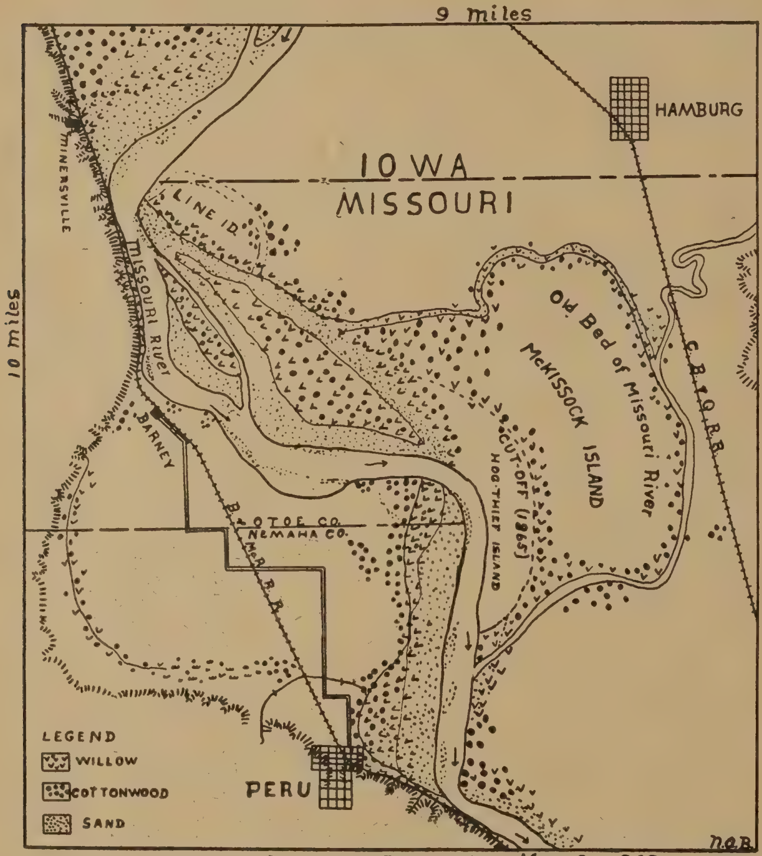
Conditions north of Peru, Nebraska, furnish an interesting example of the same kind of control of river changes. (See Fig. 3.) When Nebraska was organized as a territory the river had the position indicated as the old bed of the Missouri river. This was made the eastern boundary of the territory. At the flood of 1865 the cutoff was effected, a portion of the floodplain transferred to the Iowa-Missouri side. This portion, known as McKissock Island, had water practically only on three sides. Another area was included between the forks of the river and received the name Hog-Thief Island from the fact that for a time there was a doubt as to which state had legal jurisdiction there. Various literary masterpieces have been called forth by the conditions affecting the historic station of Barney. In 1879 the Burlington and Missouri River Railroad had the position indicated by a straight line from Peru, direction north 26° west, until it reached the bluff near Barney. The river was then more than two miles due north of the Otoe-Nemaha county line. It first struck the bank near Minersville and followed the bluff for several miles. The angle from which the stream came in was such that as the meander progressed there must be some deflection from the bank. The bluffs make an angle of 15° with a north


9 miles
10 miles
HAMBURG
IOWA
MISSOURI
Line of Missouri River
McKISSOCK ISLAND
HOG-THIEF ISLAND
CUT-OFF (1865)
C.B.&Q. R.R.
BARNEY
PERU BOTTOMS
OTOE CO.
NEMAHA CO.
B.&M. R.R.
Wagon Road
PERU
LEGEND
WILLOW
COTTONWOOD
SAND
n.a.B.

Missouri River near Peru, Nebr. 1879.

FIG. 3.

and south line. These conditions caused the main channel to be deflected to the south-east as indicated by the cut-bank on Line Island, but there was a small distributary following the bluff until near Barney where it was deflected toward the east. While this condition lasted the high floodplain was not being cut very rapidly because the bluffs, situated as they were, served as a protective barrier. In this position normal deflection would tend to throw the stream just south of Line Island. The cutting on the floodplain was done by only a portion of the stream. With the downstream progress of the meander it was inevitable that very rapid cutting would ensue.


9 miles
10 miles
HAMBURG
IOWA
MISSOURI
MINERSVILLE
LINE ID
MISSOURI River
BARNEY
Old Bed of Missouri River
McKISSOCK ISLAND
CUT-OFF (1865)
HOG-THIEF ISLAND
C.B.&Q.R.R.
OTOE CO.
NEMAHA CO.
B.&M.R.R.
LEGEND
WILLOW
COTTONWOOD
SAND
PERU
n.e.B.

Missouri River near Peru, Nebr., May 9, 1908.

FIG. 5.

Before 1890 the branch of the channel between Hog-Thief Island and McKissock Island was abandoned and a fusion of islands had occurred. The geological significance of these movements is of interest. The county superintendent of Nemaha county, Nebraska, to which the island belongs, must pass thru parts of Nebraska, Iowa and Missouri in order to visit the school at the island. The farmers there cannot sell their products in their own state, their industrial relations are with Missouri and Iowa, but they help determine the political affairs of Nebraska. In the election of 1907 the island vote determined the political complexion of two of Nemaha's county officials. In 1890 the course of the upper meander had become more pronounced. The stream cut the bank almost at right angles at Minersville, was deflected and gave rise to a cut bank north of Line Island with sand bars on both sides of the channel below that point. The Barney station had been moved almost three-fourths of a mile farther south. About 500 acres of land had been cut away just north of Barney. To the east where the main force of the current struck fully 800 acres were removed. But at this time landowners near Barney felt but little apprehension for they considered the bar a protection to them and took it as proof that the channel would migrate toward the Missouri side. This bar was being cut slowly on the north side, and it was but a question of time until the meander should progress beyond it and the stream exert its full force on the floodplain unless held in check by artificial means.

Since 1890 the changes have been marked. (See Fig. 5.) The meander has progressed beyond the south spur of the bluffs and since then the cutting has been rapid. In July, 1907, Barney station was moved to a point nearly half a mile southwest of its former location. The railroad had to find a new right of way. Notwithstanding all these marked changes note a conformity to the same general features shown previously. The floodplain was for a long time partially protected by a spur in the bluff, and while the meander was thus checked cutting was not rapid. When the barrier was passed abnormal cutting began. North of Peru the plain has not been flooded since 1882, lacking 3 or 4 feet. Structural conditions of the floodplain favor erosion. At low water the plain is about sixteen to twenty feet above the river surface. The lower twelve feet is loosely cemented sand interstratified in places with thin layers of fine silt or clay. The upper three to six feet are composed of much finer materials, mostly silt mixed with organic matter which becomes very compact and is sometimes known as "gumbo." This is a condition very common in the Missouri river floodplain and causes erosion to be done very largely by undermining which leads to the falling in of strips of land from two to twenty feet wide and sometimes several rods long. The cutting varies with the local conditions at each place and with the stage of the river. Cutting occurs at but relatively few places at low water stages and always slowly, while just the opposite is true of the high water stages. The cutting on the Peru floodplain was unusually great during the summer of 1907 partially at least because the last of the sand bar noted on the map for 1890 was cut away early in July. This bar had served to divide the current, hence only a part of the force of the stream was exerted against the higher terrace. The bar also increased friction and thus reduced the cutting power. The losses due to cutting in 1907 as measured in acres were severe. The owners named suffered as follows: Mr. Wells, 60 acres; Mr. Rawson, 40 acres; Mr. Cook, 12 acres; Mr. Brunsdon, 40 acres; Mr. Adams, 36 acres; Mr. Wheeler, 23 acres; or a total loss from June 1, 1907, to May 8, 1908, of 211 acres. In productiveness this land ranks with the best that can be found anywhere. If it were not menaced by the river it would easily have a market value of $100 per acre. Thus computed the loss in the single season was $21,100. A careful study of the records shows that in this floodplain area fully 2,000 acres of excellent land have been cut away since 1879, the value of which can conservatively be stated at $200,000. This represents the losses at but one place, and Nebraska has many areas which have suffered to a greater or less extent.

In the agitation for a conservation of our natural resources the case of the Missouri river floodplain deserves careful consideration. The Missouri river is known as an erratic stream. This is undeserved. The Missouri responds to its geographical conditions. However, there are stages when a slight control may cause its development to respond to man's needs, whereas the omission of such may result in serious later disasters. The cutting is most severe during high water stages, this being especially true of the June rise. Forestation and the construction of an extensive system of reservoirs for storage of its headwaters may make it possible to regulate in some degree the volume of the stream quite completely and thus assist in eliminating the disasters due to the annual floods. This construction work has been begun, having in view chiefly the power and irrigation interests. Let the Missouri floodplain problem also be considered and make its protection as perfect as possible. River navigation also is aided by uniform river volume, but it demands that the channel be kept free from snags. For this purpose the government should furnish patrol boats whose whole duty should be to keep the deep water channel free from dangerous obstructions.

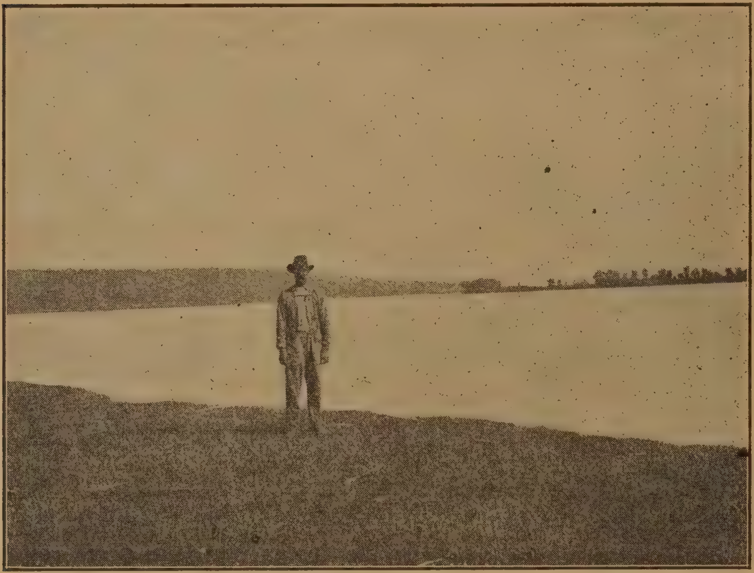


FIG. 6.—"The Last Stand." View looking north showing where Mr. Brunsdon's 240-acre farm was formerly situated. Photo July 15, 1907. Six miles north of Peru, Neb. Mr. Brunsdon in the foreground on the edge of his farm. Land in foreground was washed away within a week after photo was taken.

Keeping the channel open would also aid in checking channel migration and thus reduce the cutting tendency of the stream. Each of these factors is of great importance. But more is needed. A careful study should be made of the whole floodplain in its relation to the development of the meanders. The changes are generally not erratic. The changes occur as the result of a cause or series of causes. It is very probable that in many cases it would be economically possible to check the ravages of the stream if proper corrective measures were taken in time. For instance, from a study of conditions north of Peru (see Fig. 3), it would seem that if a retaining wall had been built from the bluff about a half mile south of the Iowa-Missouri line in a southeasterly direction the stream could have been kept in its channel just south of Line Island and the extensive losses on the Peru floodplain avoided. The cost of such a wall should not have been prohibitive because the necessary limestone and sandstone are exposed in the bluff and but a very short haul would have been necessary. Two hundred thousand dollars' worth of land has been destroyed. In the face of such figures we can readily see that even if the retaining wall would have cost $20,000 it would have been a profitable investment. These projects are too extensive for individuals to contend with. The government spends its millions in reclaiming arid lands and we laud its generosity in a worthy cause. Is it then asking too much for the government to protect from destruction the lands which are of the best that can be found anywhere?

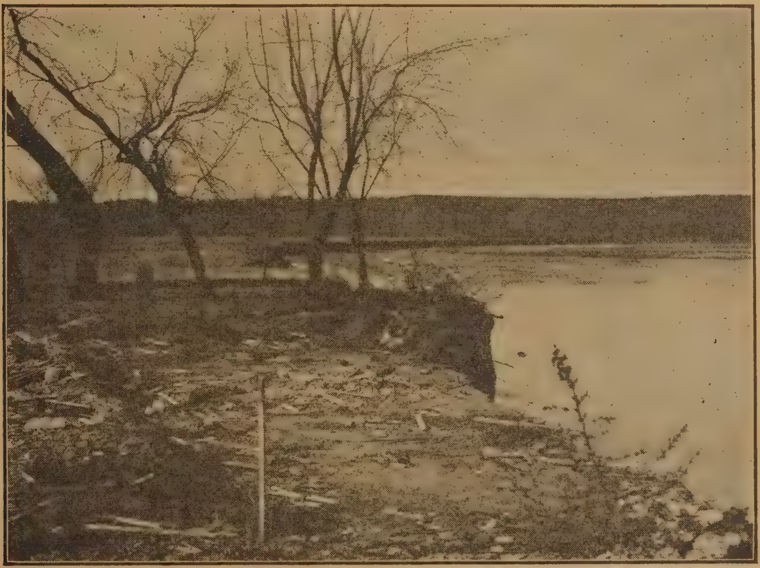


FIG. 7.—A view showing the work of the Missouri river in relation to homes. The site of Mr. Brunsdon's former home north of Peru, Nebraska, almost washed in. Photo taken November 30, 1907.

In conclusion, permit this summary: The protection of the Missouri river floodplain demands a careful and extensive study of all factors involved. The control of the Missouri will be greatly affected by four factors,—systematic forestation; the construction of reservoirs for storage of headwaters, thus equalizing flow and possibly to some extent preventing floods; the constant patrol of its channel, clearing of snags, thus tending to keep its channel open and lessen migration; a careful study of local conditions having in view the proper, timely precautionary measures of control at cut banks, if any such are economically possible. These problems should at once receive the attention of our state and federal governments in response to the plea for conservation of our great natural resources.

The chairman introduced the last speaker, saying: "We have with us to-night one of our University boys, one who has made good. I am pleased to present to you Governor Sheldon who will speak on ways and means."

WAYS AND MEANS.

GOV. GEO. L. SHELDON.

Mr. President, Ladies and Gentlemen: I have enjoyed these discussions. They have been instructive and very unlike political meetings. I have attended several meetings of late where politicians were ready to speak, but less willing to listen.

More attention should be paid to our water problems and to all of the factors which affect the farms and farmers. The water of our rivers seems lazy. It prefers not to work, but rather to wander sluggishly around its meanders, accomplishing little.

There are selfish interests to be considered in this problem of ways and means. However, they do not concern us in the present connection. The control and utilization of our rivers will require the expenditure of funds from the state and federal treasuries. The cost and returns must be considered. If the benefits in dollars and cents will exceed the necessary investment, then it may be best to perfect plans and go ahead. It is not the spirit of our government that one man's property should be torn down to build up that of another.

You investigators are working out a subject of great interest to the people. Apparently too many of our citizens are ready to act without the necessary study of the fundamentally important facts and factors. Our streams and valleys are worthy of study and control. The possibilities of their development are great, but let's make as few mistakes as possible and do the right thing.

Returning from California recently I came along the Platte valley, and I thought as I looked over it that I would not, if it were in my power, exchange that valley for the whole of California, because there is greater possibility of wealth here than in all the state of California. This valley is to be the seat of a very large and prosperous population.

If it is possible economically to check the ravages of the Missouri and to use the stream for any profitable use, we should further consider the matter in all of its aspects as has been done to-night.

NEBRASKA CROP STATISTICS.

Acreage and Production of the Principal Crops in Nebraska for a Series of Years.

CORN

Year	Acreage	Production Bushels
1907	6,586,844	169,732,885
1906	6,840,905	241,383,537
1905	6,472,487	243,713,244
1904	6,173,984	226,959,194
1903	6,130,369	169,693,965
1902	5,516,801	176,537,632
1901	5,853,967	72,445,227
1900	6,291,050	143,650,317
1899	6,436,918	175,816,641
1898	7,559,746	158,754,666
1897	6,650,798	199,523,940

OATS

Year	Acreage	Production Bushels
1907	2,494,946	53,622,262
1906	2,442,768	78,461,888
1905	2,420,624	78,552,878
1904	2,146,324	66,810,065
1903	1,958,721	66,619,505
1902	1,638,647	52,436,704
1901	1,577,936	28,287,707
1900	1,424,948	33,486,278
1899	1,628,501	51,731,132
1898	1,752,182	56,245,042
1897	1,668,745	51,731,095

WHEAT

Year	Acreage	Production Bushels
1907	2,528,339	46,187,658
1906	2,146,023	49,892,091
1905	2,091,871	41,343,757
1904	2,024,667	31,825,850
1903	2,379,378	43,660,318
1902	2,550,767	53,468,472
1901	2,456,677	50,227,484
1900	2,322,969	37,748,245
1899	1,918,287	18,848,100
1898	2,114,592	34,679,309
1897	1,893,286	27,452,647

BARLEY

Year	Acreage	Production Bushels
1907	95,373	2,246,166
1906	109,692	3,142,737
1905	188,360	5,926,331
1904	196,844	5,502,725
1903	113,717	3,013,500
1902	78,414	1,960,350
1901	74,563	1,188,688
1900	36,267	943,176
1899	33,374	587,382

RYE

Year	Acreage	Production Bushels	Year	Acreage	Production Bushels
1907	87,913	1,407,699	1902	483,554	8,703,972
1906	82,907	1,476,371	1901	155,475	2,332,125
1905	141,149	2,474,512	1900	61,073	867,237
1904	122,565	2,035,802	1899	62,319	199,704
1903	343,067	10,105,707			

CORN, 1907

COUNTY	Acreage	Av. Yield per Acre	Production Bushels	Value
The State, '07	6,586,844	25.75	169,732,885	$72,985,140 5
The State, '06	6,840,905	35.28	241,383,537	89,311,908 6
Adams	75,187	14.2	1,067,655	459,091 6
Antelope	107,448	32.4	3,481,315	1,496,965 4
Banner	2,773	18.2	50,468	21,701 2
Blaine	6,828	17.0	116,076	49,912 68
Boone	109,215	24.4	2,664,846	1,145,883 78
Box Butte	4,644	17.4	80,805	34,746 15
Boyd	61,166	31.2	1,908,379	820,602 97
Brown	26,135	27.5	718,712	309,046 16
Buffalo	176,030	22.5	3,960,675	1,703,090 25
Burt	69,315	36.8	2,550,792	1,096,840 56
Butler	109,966	33.0	3,628,878	1,560,417 54
Cass	140,646	31.8	4,472,542	1,923,193 06
Cedar	130,486	34.6	4,514,815	1,941,370 45
Chase	26,676	17.5	466,830	200,736 90
Cherry	25,887	17.5	453,022	194,799 46
Cheyenne	10,110	24.6	248,706	106,943 58
Clay	100,436	19.4	1,948,458	837,836 94
Colfax	71,987	34.0	2,447,558	1,052,449 94
Cuming	94,318	35.4	3,338,857	1,435,708 51
Custer	218,570	20.0	4,371,400	1,879,702 00
Dakota	42,536	36.6	1,556,817	669,431 31
Dawes	4,450	18.3	81,435	35,017 05
Dawson	135,787	25.5	3,462,568	1,488,904 24
Deuel	14,993	27.5	412,307	177,292 01
Dixon	77,941	31.9	2,486,317	1,069,116 31
Dodge	93,616	35.8	3,351,452	1,441,124 36
Douglas	77,764	30.2	2,348,472	1,009,842 96
Dundy	49,824	17.0	847,008	364,213 44
Fillmore	114,828	23.0	2,641,044	1,135,648 92
Franklin	80,108	10.5	841,134	361,687 62
Frontier	123,749	13.7	1,695,361	729,005 23
Furnas	104,791	13.3	1,393,720	599,299 60
Gage	169,336	36.6	6,197,697	2,665,009 71
Garfield	15,823	19.4	306,966	131,995 38
Gosper	77,900	17.6	1,371,040	589,547 20
Grant	146	15.0	2,190	941 70
Greeley	70,546	20.0	1,410,920	606,695 60
Hall	74,690	27.2	2,031,568	873,574 24
Hamilton	98,999	30.7	3,039,269	1,306,885 67
Harlan	123,956	12.0	1,487,472	639,612 96
Hayes	44,580	18.0	802,440	345,049 20
Hitchcock	33,198	16.6	551,086	236,966 98
Holt	86,539	19.2	1,661,548	714,465 64
Hooker	968	15.0	14,520	6,243 60
Howard	73,448	25.5	1,872,924	805,357 32
Jefferson	105,357	25.3	2,665,532	1,146,178 76

CORN, 1907—*Continued.*

COUNTY	Acreage	Av. Yield per Acre	Production Bushels	Value
Johnson	68,002	33.5	2,578,067	$979,568 81
Kearney	74,049	11.8	873,778	375,724 54
Keith	12,949	25.8	334,084	143,656 12
Keya Paha	30,409	18.2	553,443	237,980 49
Kimball	971	25.0	24,275	10,438 25
Knox	124,694	28.6	3,566,248	1,533,486 64
Lancaster	257,096	24.1	6,196,013	2,664,285 59
Lincoln	92,050	27.1	2,494,555	1,072,658 65
Logan	9,589	24.0	230,136	98,958 48
Loup	13,400	19.1	255,940	110,054 20
Madison	97,413	32.3	3,146,439	1,352,968 77
*McPherson	....	.....	....	....
Merrick	59,364	26.5	1,573,146	676,452 78
Nance	69,207	22.0	1,522,554	554,698 22
Nemaha	68,355	36.2	2,474,451	1,064,013 93
Nuckolls	116,548	31.5	3.671,262	1,578,642 66
Otoe	134,019	31.8	4,261,804	1,832,575 72
Pawnee	72,116	32.8	2,365,404	1,017,123 72
Perkins	15,334	21.2	325,080	139,784 40
Phelps	90,731	17.0	1,542,427	663,243 61
Pierce	85,550	30.0	2,566,500	1,103,595 00
Platte	118,793	27.3	3,243,048	1,394,510 64
Polk	67,943	26.2	1,780,106	765,445 58
Red Willow	73,989	10.0	739,890	318,152 70
Richardson	95,974	38.8	3,723,791	1,601,230 13
Rock	15,782	18.2	287,232	123,509 76
Saline	118,106	23.0	2,716,438	1,168,068 34
Sarpy	53,150	30.3	1,610,445	692,491 35
Saunders	183,710	28.0	5,143,880	2,211,868 40
Scott's Bluff	1,760	27.8	48,928	21,039 04
Seward	116,133	22.2	2,578,152	1,108,605 36
Sheridan	16,549	25.3	418,689	180,036 27
Sherman	65,194	17.2	1,121,336	482,174 48
Sioux	2,630	25.0	65,750	28,272 50
Stanton	72,010	32.3	2,325,923	1,000,146 89
Thayer	115,276	27.0	3,112,452	1,338,354 36
Thomas	3,397	15.0	30,955	21,910 65
Thurston	51,717	29.5	1,525,651	656,029 93
Valley	68,752	24.6	1,691,299	727,258 57
Washington	73,321	33.5	2,456,253	1,056,188 79
Wayne	90,932	33.6	3,055,315	1,313,785 45
Webster	106,268	16.7	1,774,675	763,110 25
Wheeler	14,225	22.5	320,062	137,626 66
York	105,691	25.2	2,663,413	1,145,267 59

*No acreage reported.

Value of corn figured at 43 cents a bushel.

WINTER WHEAT, 1907.

COUNTY	Acreage	Av. Yield per Acre	Production Bushels	Value
The State, '07	2,279,767	18.85	42,993,004	$32,244,753 00
The State, '06	1,852,085	24.5	45,389,363	29,503,085 95
Adams	87,219	17.0	1,482,723	1,112,042 25
Antelope	9,089	13.5	122,701	92,025 75
Banner	827	21.3	17,615	13,211 25
Blaine	69	15.0	103	77 25
Boone	19,433	15.0	291,495	218,621 25
Box Butte	90	16.0	1,440	1,080 00
Boyd	2,125	26.5	56,312	42,234 00
Brown	2,062	18.0	37,116	27,837 00
Buffalo	61,087	17.4	1,062,913	797,184 75
Burt	1,855	20.3	37,656	28,242 00
Butler	59,349	24.1	1,430,310	1,072,732 50
Cass	16,305	22.0	358,710	269,032 50
Cedar	2,344	13.6	31,878	23,908 50
Chase	8,328	14.5	120,756	90,567 00
Cherry	958	26.5	25,387	19,040 25
Cheyenne	1,247	25.8	32,172	24,129 00
Clay	96,846	22.7	2,198,404	1,648,803 00
Colfax	39,565	20.8	822,952	617,214 00
Cuming	3,947	17.3	68,283	51,212 25
Custer	70,109	16.2	1,135,765	815,823 75
Dakota	633	17.4	11,014	8,260 50
Dawes	795	15.0	11,925	8,943 75
Dawson	64,293	22.1	1,420,875	1,065,656 25
Deuel	837	27.4	22,933	17,199 75
Dixon	1,014	18.1	18,353	13,764 75
Dodge	22,102	25.6	565,811	424,358 25
Douglas	912	20.2	18,422	13,816 50
Dundy	4,334	15.5	67,177	50,382 75
Fillmore	78,379	22.3	1,747,851	1,310,888 75
Franklin	46,338	14.8	685,802	514,351 50
Frontier	34,435	18.0	619,830	464,872 50
Furnas	58,066	16.0	929,056	696,792 00
Gage	69,371	24.0	1,664,904	1,248,678 00
Garfield	3,302	13.5	44,577	33,432 75
Gosper	28,087	17.0	477,479	358,109 25
Grant	....	.....	....	....
Greeley	21,834	12.6	275,108	206,331 00
Hall	49,975	21.6	1,079,460	809,595 00
Hamilton	80,323	22.3	1,791,202	1,343,401 50
Harlan	61,085	13.7	836,864	627,648 00
Hayes	10,817	16.4	177,398	133,048 50
Hitchcock	33,266	14.0	465,724	349,293 00
Holt	3,569	11.8	42,114	31,585 50
Hooker	....	.....	....	....
Howard	38,753	16.5	639,424	479,568 00
Jefferson	43,314	20.2	874,942	656,206 50

WINTER WHEAT, 1907—*Continued.*

COUNTY	Acreage	Av. Yield per Acre	Production Bushels	Value
Johnson	23,122	21.5	497,123	$372,842 25
Kearney	85,255	14.9	2,170,299	952,724 25
Keth	1,715	26.5	45,447	34,085 25
Keya Paha	888	11.5	10,212	7,659 00
Kimball	10	18.0	180	135 00
Knox	1,331	13.6	18,101	13,575 75
Lancaster	60,032	20.0	1,200,640	900,480 00
Lincoln	14,968	21.3	318,818	239,113 50
Logan	594	25.0	14,850	11,137 50
Loup	1,718	14.0	24,052	18,039 00
Madison	6,618	15.5	102,579	76,934 25
McPherson	....	.....	....	....
Merrick	18,664	21.5	401,276	300,957 00
Nance	38,711	13.1	507,114	380,335 50
Nemaha	30,162	22.1	666,580	499,935 00
Nuckolls	42,559	20.5	872,459	654,344 25
Otoe	32,953	26.0	856,778	642,583 50
Pawnee	16,578	22.2	368,031	276,023 25
Perkins	1,702	23.2	39,486	29,614 50
Phelps	78,644	13.0	1,022,372	766,779 00
Pierce	2,868	14.1	40,438	30,328 50
Platte	38,139	17.2	665,990	491,992 50
Polk	41,264	17.9	738,625	553,968 75
Red Willow	63,280	13.0	822,640	616,980 00
Richardson	25,019	24.5	612,965	459,723 75
Rock	373	17.0	6,341	4,755 75
Saline	63,192	21.5	1,358,628	1,018,971 00
Sarpy	2,903	25.1	72,865	54,648 75
Saunders	25,060	24.3	608,958	456,718 50
Scott's Bluff	1,841	11.0	20,251	15,188 25
Seward	56,646	22.4	1,268,870	951,652 50
Sheridan	934	20.5	19,147	14,360 25
Sherman	23,564	18.1	426,508	319,881 00
Sioux	546	18.5	10,101	7,575 75
Stanton	4,530	20.1	91,053	68,289 75
Thayer	56,146	18.0	1,010,628	757,971 00
Thomas	....	.....	....	....
Thurston	676	20.7	13,993	10,494 75
Valley	36,737	14.8	543,707	407,780 25
Washington	7,270	21.5	156,305	117,228 75
Wayne	2,346	17.1	40,116	30,087 00
Webster	45,187	15.1	682,323	511,742 25
Wheeler	1,166	11.0	12,826	9,619 50
York	85,168	20.2	1,720,393	1,290,294 75

Value of winter wheat figured at 75 cents a bushel.

SPRING WHEAT, 1907.

COUNTY	Acreage	Av. Yield per Acre	Production Bushels	Value
The State, '07	248,572	12.93	3,214,654	$2,410,990 50
The State, '06	293,948	15.31	4,502,728	2,836,718 64
Adams	192	10.0	1,920	1,440 00
Antelope	2,344	10.5	24,612	18,459 00
Banner	5,354	15.0	80,310	60,232 50
Blaine	39	10.0	390	292 50
Boone	1,339	9.0	12,051	9,038 25
Box Butte	5,803	14.0	81,242	60,931 50
Boyd	7,224	11.0	79,464	59,598 00
Brown	4,196	13.0	54,548	40,911 00
Buffalo	3,463	8.6	29,781	22,335 75
Burt	7,150	13.5	96,525	72,393 75
Butler	783	19.0	14,877	11,157 75
Cass	5,873	15.6	91,618	68,713 50
Cedar	3,403	10.0	34,030	25,522 50
Chase	4,107	11.0	45,177	33,882 75
Cherry	3,597	10.7	38,487	28,865 25
Cheyenne	11,273	18.2	205,168	153,876 00
Clay	31	15.0	465	348 75
Colfax	3,219	7.5	24,142	18,106 50
Cuming	8,174	9.8	80,105	60,078 75
Custer	8,286	14.0	116,004	87,003 00
Dakota	8,399	11.2	94,068	70,551 00
Dawes	9,857	14.0	137,998	103,498 50
Dawson	716	16.6	11,885	8,913 75
Deuel	2,414	21.6	52,142	39,106 50
Dixon	2,920	11.6	33,872	25,404 00
Dodge	2,486	15.0	37,290	27,967 50
Douglas	1,697	12.2	20,703	15,527 25
Dundy	3,318	11.0	36,498	27,373 50
Fillmore	14	12.0	168	126 00
Franklin	65	20.0	1,300	975 00
Frontier	2,265	13.5	30,577	22,932 75
Furnas	184	11.0	2,024	1,518 00
Gage	......	....	....	....
Garfield	233	13.3	3,098	2,323 50
Gosper	122	14.0	1,708	1,281 00
Grant	10	13.0	130	97 50
Greeley	1,379	10.0	13,790	10,342 50
Hall	68	10.0	680	510 00
Hamilton	70	10.5	735	551 25
Harlan	3,000	10.0	30,000	22,500 00
Hayes	4,207	12.7	53,428	40,071 00
Hitchcock	7,096	10.0	70,960	53,220 00
Holt	2,318	9.0	20,862	15,646 50
Hooker	5	12.0	60	45 00
Howard	535	14.7	7,864	5,898 00
Jefferson	47	16.0	752	564 00

SPRING WHEAT, 1907—*Continued.*

COUNTY	Acreage	Av. Yield per Acre	Production Bushels	Value
Johnson	....	.....	....	....
Kearney	415	11.0	4,565	$3,423 75
Keith	2,670	20.0	53,400	40,050 00
Keya Paha	7,106	11.2	79,587	59,690 25
Kimball	1,902	12.2	23,204	17,403 00
Knox	6,810	8.0	54,480	40,860 00
Lancaster	80	15.0	1,200	900 00
Lincoln	15,908	16.7	265,663	199,247 25
Logan	830	17.5	14,525	10,893 75
Loup	282	10.2	2,876	2,157 00
Madison	1,699	11.4	19,368	14,526 00
McPherson	....	.....	....	....
Merrick	2	12.0	24	18 00
Nance	40	11.0	440	330 00
Nemaha	77	21.0	1,617	1,212 75
Nuckolls	....	.....	....	....
Otoe	898	15.4	13,829	10,371 75
Pawnee	....	.....	....	....
Perkins	4,263	17.2	73,323	54,992 25
Phelps	119	12.5	1,487	1,115 25
Pierce	2,380	10.6	25,228	18,921 00
Platte	4,073	12.0	48,876	36,657 00
Polk	3	12.0	36	27 00
Red Willow	6,593	11.0	72,523	54,392 25
Richardson	....	.....	....	....
Rock	636	12.2	7,759	5,819 25
Saline	13	11.0	143	107 25
Sarpy	2,011	14.1	28,355	21,266 25
Saunders	1,425	12.0	17,100	12,825 00
Scott's Bluff	1,058	20.2	21,371	16,028 25
Seward	37	10.0	370	277 50
Sheridan	24,473	13.8	337,727	253,295 25
Sherman	529	8.0	4,232	3,174 00
Sioux	2,475	16.7	41,332	30,999 00
Stanton	2,875	11.0	31,625	23,718 75
Thayer	11	12.0	132	99 00
Thomas	570	16.0	9,120	6,840 00
Thurston	2,500	11.1	27,750	20,812 50
Valley	1,766	11.1	19,602	14,701 50
Washington	5,918	11.6	68,648	51,486 00
Wayne	5,646	10.2	57,589	43,191 75
Webster	72	10.0	720	540 00
Wheeler	1,132	10.0	11,320	8,490 00
York	....	.....	....	....

Value of spring wheat figured at 75 cents a bushel.

OATS, 1907

COUNTY	Acreage	Av. Yield per Acre	Production Bushels	Value
The State, '07	2,494,946	21.49	53,622,262	$20,376,459 56
The State, '06	2,442,768	32.12	78,461,888	21,969,328 64
Adams	19,510	19.6	382,396	145,310 48
Antelope	74,794	25.8	1,929,685	733,280 30
Banner	4,592	30.0	137,760	52,348 80
Blaine	837	25.0	20,925	7,951 50
Boone	78,889	20.0	1,577,780	599,556 40
Box Butte	6,144	25.4	156,057	59,301 66
Boyd	36,422	30.0	1,092,660	415,210 80
Brown	12,723	29.0	368,967	140,207 46
Buffalo	40,721	23.1	940,655	357,448 90
Burt	37,480	27.7	1,038,196	394,514 48
Butler	52,981	25.1	1,329,823	505,332 74
Cass	36,602	20.3	743,020	282,347 60
Cedar	95,733	18.5	1,771,060	673,002 80
Chase	2,041	23.1	47,147	17,915 86
Cherry	14,862	26.0	386,412	146,836 56
Cheyenne	4,997	38.0	189,886	72,156 68
Clay	24,829	19.1	474,233	180,208 54
Colfax	45,556	18.5	842,786	320,258 68
Cuming	59,187	22.8	1,349,463	512,795 94
Custer	67,062	27.5	1,844,205	700,797 90
Dakota	19,944	23.1	460,706	175,068 28
Dawes	7,664	20.0	153,580	58,246 40
Dawson	30,652	32.3	990,059	376,222 42
Deuel	2,194	38.0	83,372	31,681 36
Dixon	52,755	24.5	1,292,497	491,148 86
Dodge	53,358	23.5	1,253,913	476,486 94
Douglas	20,916	24.5	512,441	194,727 96
Dundy	1,385	32.5	45,012	17,104 56
Fillmore	38,529	18.6	716,639	272,322 82
Franklin	11,562	23.7	274,019	104,127 22
Frontier	23,864	27.0	642,328	244,084 64
Furnas	9,032	25.1	226,703	86,147 14
Gage	56,019	22.8	1,277,233	485,348 54
Garfield	6,616	24.0	158,784	60,337 92
Gosper	8,784	27.8	244,195	92,794 10
Grant	3	20.0	60	22 80
Greeley	45,187	19.8	894,702	339,986 76
Hall	27,757	22.8	632,859	240,486 42
Hamilton	30,614	18.0	551,052	209,399 76
Harlan	16,467	22.2	365,567	138,915 46
Hayes	4,874	26.3	128,186	48,710 68
Hitchcock	2,711	23.0	62,353	23,694 14
Holt	49,199	19.1	939,700	357,986 00
Hooker	114	18.0	2,052	779 76
Howard	27,591	21.8	601,483	228,563 54
Jefferson	32,268	20.1	648,586	246,462 68

OATS, 1907—*Continued.*

COUNTY	Acreage	Av. Yield per Acre	Production Bushels	Value
Johnson	21,469	21.5	461,583	$175,401 54
Kearney	22,224	19.6	435,590	165,524 20
Keith	2,424	35.0	84,840	32,239 20
Keya Paha	11,726	27.0	316,602	120,308 76
Kimball	1,837	28.0	51,436	19,545 68
Knox	95,295	16.0	1,524,720	579,393 60
Lancaster	59,984	18.5	1,109,704	421,687 52
Lincoln	10,843	37.0	401,191	152,452 58
Logan	2,735	27.5	75,212	28,580 56
Loup	5,143	25.0	128,575	48,858 50
Madison	77,991	21.1	1,645,610	625,331 80
McPherson	....	.....	....	....
Merrick	16,259	18.5	300,791	114,300 58
Nance	30,136	16.5	497,244	188,952 72
Nemaha	16,481	27.0	444,987	169,095 06
Nuckolls	24,130	19.3	465,709	176,969 42
Otoe	42,209	20.6	869,505	330,411 90
Pawnee	17,580	23.5	413,130	156,989 40
Perkins	1,634	31.2	50,980	19,372 40
Phelps	19,794	18.5	366,189	139,151 82
Pierce	62,406	21.3	1,329,247	505,113 86
Platte	80,840	16.5	1,333,860	506,866 80
Polk	27,913	18.0	502,434	190,924 92
Red Willow	4,573	19.1	87,344	33,190 72
Richardson	24,179	31.8	768,892	292,178 96
Rock	5,397	25.4	137,083	52,091 54
Saline	40,496	17.1	692,481	263,142 78
Sarpy	19,043	23.1	439,893	167,159 34
Saunders	71,591	18.7	1,338,751	508,725 38
Scott's Bluff	9,923	36.6	363,181	138,008 78
Seward	42,444	14.4	611,193	232,253 34
Sheridan	11,312	31.0	350,672	133,255 36
Sherman	19,190	22.8	437,532	166,262 16
Sioux	3,310	35.0	115,850	44,023 00
Stanton	47,932	18.8	901,121	342,425 98
Thayer	33,944	20.8	706,035	268,293 30
Thomas	897	13.5	12,109	4,601 42
Thurston	22,007	19.0	418,133	158,890 54
Valley	26,339	22.8	600,529	228,201 02
Washington	38,761	24.3	941,892	357,918 96
Wayne	63,908	18.0	1,150,034	437,012 92
Webster	14,798	19.2	284,121	107,965 98
Wheeler	9,119	19.0	17,326	6,583 88
York	38,709	17.0	658,053	250,060 14

BARLEY, 1907.

COUNTY	Acreage	Av. Yield per Acre	Production Bushels	Value
The State, '07	95,373	23.55	2,246,166	$1,123,083 00
The State, '06	109,692	28.65	3,142,727	1,257,090 80
Adams	95	25.0	2,375	1,187 50
Antelope	188	31.2	5,865	2,932 50
Banner	324	40.0	12,960	6,480 00
Blaine	1	20.0	20	10 00
Boone	347	20.0	6,940	3,470 00
Box Butte	2,698	26.0	70,148	35,074 00
Boyd	155	23.0	3,565	1,782 50
Brown	444	30.0	13,320	6,660 00
Buffalo	119	29.0	3,451	1,725 50
Burt	2,530	29.5	74,635	37,317 50
Butler	92	15.0	1,380	690 00
Cass	30	25.0	750	375 00
Cedar	1,437	28.3	40,667	20,333 50
Chase	2,833	16.0	45,328	22,664 00
Cherry	439	22.5	9,877	4,938 50
Cheyenne	1,129	32.0	36,128	18,064 00
Clay	196	25.0	4,900	2,450 00
Colfax	222	21.2	4,706	2,353 00
Cuming	483	30.0	14,490	7,245 00
Custer	3,201	23.5	75,223	37,611 50
Dakota	3,139	21.3	66,860	33,430 00
Dawes	2,290	25.0	57,250	28,625 00
Dawson	657	34.7	22,797	11,398 50
Deuel	1,233	38.2	47,100	23,550 00
Dixon	795	25.7	20,431	10,215 50
Dodge	472	30.0	14,160	7,080 00
Douglas	590	18.0	10,620	5,310 00
Dundy	5,245	20.0	104,900	52,450 00
Fillmore	16	21.0	336	168 00
Franklin	83	17.5	1,452	726 00
Frontier	16,037	21.6	346,399	173,199 50
Furnas	1,540	22.8	35,112	17,556 00
Gage	17	20.0	340	170 00
Garfield	91	15.5	1,410	705 00
Gosper	121	18.0	2,178	1,089 00
Grant	....	.....	....	....
Greeley	244	25.0	6,100	3,050 00
Hall	233	32.0	7,456	3,728 00
Hamilton	42	40.0	1,680	840 00
Harlan	5,413	18.3	99,057	49,528 50
Hayes	3,632	28.4	103,148	51,574 00
Hitchcock	10,492	25.0	262,300	131,150 00
Holt	379	20.0	7,580	3,790 00
Hooker	....	.....	....	....
Howard	227	20.0	4,540	2,270 00
Jefferson	37	24.0	888	444 00

BARLEY, 1907—*Continued.*

COUNTY	Acreage	Av. Yield per Acre	Production Bushels	Value
Johnson	....	.....	....	....
Kearney	79	20.0	1,580	$790 00
Keith	392	30.0	11,760	5,880 00
Keya Paha	673	26.6	17,901	8,950 50
Kimball	379	23.3	8,830	4,415 00
Knox	688	21.6	14,860	7,430 00
Lancaster	160	22.0	3,520	1,760 00
Lincoln	2,193	33.0	72,369	36,184 50
Logan	1,044	30.0	31,320	15,660 00
Loup	....	.....	....	....
Madison	226	23.3	5,265	2,632 50
McPherson	....	.....	....	....
Merrick	259	27.0	6,993	3,496 50
Nance	46	23.0	1,058	529 00
Nemaha	18	27.0	486	243 00
Nuckolls	50	20.0	1,000	500 00
Otoe	76	30.0	2,280	1,140 00
Pawnee	6	20.0	120	60 00
Perkins	265	30.0	7,950	3,975 00
Phelps	53	20.0	1,060	530 00
Pierce	252	24.8	6,249	3,124 50
Platte	883	21.6	19.072	9,536 00
Polk	56	14.0	784	392 00
Red Willow	9,701	16.7	162,006	81,003 00
Richardson	225	32.5	7,312	3,656 00
Rock	43	20.0	860	430 00
Saline	140	22.0	3,080	1,540 00
Sarpy	141	32.5	4,582	2,291 00
Saunders	22	17.0	374	187 00
Scott's Bluff	256	52.5	13.440	6.720 00
Seward	91	30.0	2,730	1365 00
Sheridan	1,908	24.7	47,127	23,563 50
Sherman	89	21.7	1,931	965 50
Sioux	340	30.0	10,200	5,100 00
Stanton	351	28.2	9,898	4,949 00
Thayer	38	21.0	798	399 00
Thomas	10	20.0	200	100 00
Thurston	1,735	29.0	50,315	25,157 50
Valley	228	28.2	6,429	3,214 50
Washington	1,163	27.0	31,401	15.700 50
Wayne	679	27.5	18,672	9.336 00
Webster	185	18.0	3,330	1,665 00
Wheeler	133	20.0	2,660	1.330 00
York	109	32.5	3,542	1,771 00

Value of barley at 50 cents a bushel.

RYE, 1907.

COUNTY	Acreage	Av. Yield per Acre	Production Bushels	Value
The State, '07	87,913	16.01	1,407,699	$844,619 40
The State, '06	82,970	17.79	1,476,371	738,185 50
Adams	73	16.5	1,204	722 40
Antelope	3,219	14.5	46,675	28,005 00
Banner	670	18.3	12,261	7,356 60
Blaine	658	17.5	11,515	6,909 00
Boone	697	15.0	10,455	6,273 00
Box Butte	2,370	14.7	34,839	20,903 40
Boyd	636	16.0	10,176	6,105 60
Brown	2,668	16.6	44,288	26,572 80
Buffalo	1,148	13.5	15,498	9,298 80
Burt	179	26.0	4,654	2,792 40
Butler	378	20.0	7,560	4,536 00
Cass	206	20.0	4,120	2,472 00
Cedar	349	22.5	7,852	4,711 20
Chase	890	12.2	10,858	6,514 80
Cherry	680	13.5	9,180	5,508 00
Cheyenne	3,571	21.4	76,419	45,851 40
Clay	149	18.0	2,682	1,609 20
Colfax	476	13.8	6,568	3,940 80
Cuming	266	27.5	7,315	9,389 00
Custer	3,921	16.1	63,128	37,876 80
Dakota	37	20.0	740	444 00
Dawes	1,993	20.0	39,860	23,916 00
Dawson	1,920	17.8	34,176	20,505 60
Deuel	4,579	19.8	90,664	54,398 40
Dixon	75	12.0	900	540 00
Dodge	227	19.3	4,381	2,628 60
Douglas	84	20.0	1,680	1,008 00
Dundy	641	15.0	9,615	5,769 00
Fillmore	111	20.0	2,220	1,332 00
Franklin	109	16.0	1,744	1,046 40
Frontier	3,027	20.0	60,540	36,324 00
Furnas	750	14.8	11,100	6,660 00
Gage	232	25.0	5,800	3,480 00
Garfield	646	10.5	6,783	4,069 80
Gosper	267	16.7	4,458	2,674 80
Grant	....	.....	....	....
Greeley	3,016	15.0	45,240	27,144 00
Hall	678	19.3	13,085	7,851 00
Hamilton	43	18.0	774	464 40
Harlan	4,124	13.2	54,436	32,661 60
Hayes	1,582	15.0	23,730	14,238 00
Hitchcock	684	12.6	8,618	5,170 80
Holt	7,895	11.0	86,845	52,107 00
Hooker	280	15.0	4,200	2,520 00
Howard	2,991	15.6	46,659	27,995 40
Jefferson	128	16.3	2,086	1,251 60

RYE, 1907—*Continued.*

COUNTY	Acreage	Av. Yield per Acre	Production Bushels	Value
Johnson	10	15.0	150	$90 00
Kearney	171	11.0	1,881	1,128 60
Keith	635	26.0	16,510	9,906 00
Keya Paha	1,571	11.5	18,066	10,839 60
Kimball	692	13.6	9,411	5,646 60
Knox	875	13.0	11,375	6,825 00
Lancaster	150	15.0	2,250	1,350 00
Lincoln	2,909	20.7	60,216	36,129 60
Logan	608	20.0	12,160	7,296 00
Loup	640	11.2	7,168	4,300 80
Madison	1,279	16.2	20,719	12,431 40
McPherson	....	.....	....	....
Merrick	1,152	14.0	16,128	9,676 80
Nance	316	7.5	2,370	1,422 00
Nemaha	159	15.6	2,480	1,488 00
Nuckolls	230	15.0	3,450	2,070 00
Otoe	208	21.5	4,472	2,683 20
Pawnee	56	16.0	896	537 60
Perkins	289	16.2	4,681	2,808 60
Phelps	289	13.0	3,757	2,254 20
Pierce	2,023	14.3	28,928	17,356 80
Platte	715	13.5	9,652	5,791 20
Polk	344	18 6	6,398	3,838 80
Red Willow	1,472	13.0	19,136	11,481 60
Richardson	164	26.6	4,362	2,617 20
Rock	1,176	15.6	18,345	11,007 00
Saline	243	16.4	3,985	2,391 00
Sarpy	55	17.8	979	587 40
Saunders	687	17.0	11,679	7,007 40
Scott's Bluff	72	27.5	1,980	1,188 00
Seward	101	23.5	2,343	1,432 80
Sheridan	2,596	18.8	48,804	29,282 40
Sherman	547	20.0	10,940	6,564 00
Sioux	997	18.6	18,544	11,126 40
Stanton	961	16.4	15,760	9,456 00
Thayer	88	15.0	1,320	792 00
Thomas	467	19.0	8,873	5,323 80
Thurston	71	20.0	1,420	852 00
Valley	492	13.7	6,740	4,044 00
Washington	165	26.0	4,290	2,574 00
Wayne	377	20.0	7,540	4,524 00
Webster	368	12.5	4,600	2,760 00
Wheeler	2,019	11.2	22,612	13,567 20
York	151	18.0	2,718	1,630 80

Value of rye figured at 60 cents a bushel.

ALFALFA, 1907.

COUNTY	Acreage	Av. Yield per Acre	Production Tons	Value
The State, '07	455,592	3.16	1,450,759	$11,606,072
The State, '06	365,651	3.67	1,340,642	10,725,136
Adams	10,386	2.6	27,003	216,024
Antelope	7,649	3.3	25,241	201,928
Banner	808	2.7	2,181	17,448
Blaine	161	2.0	322	2,576
Boone	12,398	3.1	38,433	307,464
Box Butte	453	2.3	1,041	8,328
Boyd	1,872	4.0	7,488	59,904
Brown	644	2.5	1,610	12,880
Buffalo	26,803	3.5	93,810	750,480
Burt	2,214	4.2	9,298	74,384
Butler	1,570	4.0	6,280	50,240
Cass	819	4.3	3,521	28,168
Cedar	2,014	3.2	6,444	51,552
Chase	837	2.6	2,176	17,408
Cherry	1,792	2.5	4,480	35,840
Cheyenne	3,683	3.1	11,417	91,336
Clay	8,453	3.1	26,204	209,632
Colfax	2,341	4.2	9,832	78,656
Cuming	2,882	4.3	12,392	99,136
Custer	25,437	2.8	71,223	569,784
Dakota	1,155	3.2	3,696	29,568
Dawes	3,011	2.6	7,828	62,624
Dawson	27,392	3.4	93,132	745.056
Deuel	1,914	4.0	7,656	61,248
Dixon	2,372	3.6	8,539	68,312
Dodge	1,123	3 4	3,818	30,544
Douglas	1,947	4.8	9,345	74,760
Dundy	1,380	2.9	4,002	32,016
Fillmore	5,802	3.3	19,146	153,168
Franklin	11,453	2.7	30,923	247,384
Frontier	1,769	3.4	6,014	48,112
Furnas	11,289	4.6	51,929	415,432
Gage	5,253	3.4	17.860	142.880
Garfield	2,352	3.7	8,702	69,616
Gosper	2,187	2.9	6,342	50,736
Grant	131	4.0	524	4,192
Greeley	7,511	2.9	21.781	174.248
Hall	12,791	3 4	43.489	347,912
Hamilton	6,590	3.4	22.406	174.248
Harlan	11,727	3.2	37.526	300.208
Hayes	1,361	4.0	5,444	43.552
Hitchcock	1,797	3.5	6,289	50.312
Holt	3,172	2.6	8,247	65,976
Hooker	....	.....	....	....
Howard	7,326	3.0	21.978	175.824
Jefferson	9,530	3.0	28,590	228.720

ALFALFA, 1907—*Continued.*

COUNTY	Acreage	Av. Yield per Acre	Production Tons	Value
Johnson	1,714	3.1	5,313	$42,504
Kearney	9,058	2.2	19,927	159,416
Keith	3,006	3.8	11,422	91,376
Keya Paha	2,091	2.1	4,391	35,128
Kimball	1,501	3.6	5,403	43,224
Knox	2,714	3.9	10,584	84,672
Lancaster	3,860	3.6	13,896	111,168
Lincoln	7,306	3.0	21,918	175,344
Logan	97	2.0	194	1,552
Loup	1,394	2.5	3,485	27,880
Madison	2,875	3.4	9,775	78,200
McPherson	....	.....	....	....
Merrick	4,103	3.5	14,360	114,880
Nance	15,498	2.6	40,294	322,352
Nemaha	2,604	3.3	8,593	68,744
Nuckolls	17,349	3.1	53,781	430,248
Otoe	1,493	3.2	4,777	38,216
Pawnee	2,290	3.4	7,786	62,288
Perkins	192	1.0	192	1,536
Phelps	5.875	2.7	15,862	126,896
Pierce	1,114	3 4	3,787	30,296
Platte	7,123	3.7	26,355	210,840
Polk	1,815	3.8	6,897	55,176
Red Willow	8,112	3.3	26,769	214,152
Richardson	5,870	4.4	25,828	206,624
Rock	648	2.7	1,749	13,992
Saline	4,468	3.2	14,297	114,376
Sarpy	1,538	3.4	5,229	41,832
Saunders	2,070	3.7	7,659	61,272
Scott's Bluff	6,370	3.5	22,295	178,360
Seward	2,961	3.4	10,067	80,536
Sheridan	2,982	3.0	8,946	71,568
Sherman	7,930	3.1	24,583	196,664
Sioux	1,1175	4.3	5,052	40,416
Stanton	2,818	3.5	9,863	78,904
Thayer	10,393	2.7	28,061	224,488
Thomas	114	2.5	285	2,280
Thurston	335	4.0	1,340	10,720
Valley	14,386	2.7	38,842	310,736
Washington	4,007	3.6	14,425	115,400
Wayne	1,072	2.3	2,465	19,720
Webster	20,913	2.6	54,373	434,984
Wheeler	1,148	2.7	3,099	24,792
York	5,659	3.7	20,938	167,504

Value of alfalfa figured at $8.00 a ton.

TAME HAY, 1907.

COUNTY	Acreage	Av. Yield per Acre	Production Tons	Value
The State, '07	1,032,214	1.56	1,617,623	$10,514,549 50
*The State, '06	....	.....	....	....
Adams	5,494	1.75	9,614	62,491 00
Antelope	7,422	1.50	11,133	72,364 50
Banner	100	1.50	150	975 00
Blaine	33	1.25	41	266 50
Boone	11,860	1.68	19,924	129,506 00
Box Butte	1,086	1.00	1,086	7,059 00
Boyd	1,118	1.75	1,956	12,714 00
Brown	848	1.70	1,441	9,366 50
Buffalo	3,724	1.30	4,841	31,466 50
Burt	33,790	2.03	68,593	445,854 50
Butler	19,085	1.65	31,490	204,685 00
Cass	35,682	1.75	62,443	405,879 50
Cedar	29,142	1.80	52,455	340,957 50
Chase	4	1.15	4	26 00
Cherry	1,381	1.25	1,726	11,219 00
Cheyenne	97	1.20	116	754 00
Clay	11,783	1.20	14,139	91,903 50
Colfax	9,378	1.70	15,942	103,623 00
Cuming	37,252	1.18	43,957	285,720 50
Custer	4,182	1.30	5,436	35,334 00
Dakota	6,556	1.94	12,718	82,667 00
Dawes	58	1.08	62	403 00
Dawson	1,078	1.78	1,918	12,467 00
Deuel	448	1.10	492	3,198 00
Dixon	19,742	2.06	40,682	264,433 00
Dodge	51,259	1.70	87,140	566,410 00
Douglas	14,601	1.50	21,901	142,356 50
Dundy	17	1.20	20	130 00
Fillmore	20,054	1.20	24,064	156,416 00
Franklin	1,586	1.15	1,823	11,849 50
Frontier	504	1.65	831	5,401 50
Furnas	457	1.35	616	4,004 00
Gage	33,983	1.45	49,275	320,287 50
Garfield	1,011	1.30	1,314	8,541 00
Gosper	465	1.43	664	4,316 00
Grant	9	2.00	18	117 00
Greeley	512	1.30	665	4,322 50
Hall	2,410	1.25	3,012	19,578 00
Hamilton	24,211	1.65	39,948	259,662 00
Harlan	690	1.36	938	6,097 00
Hayes	21	1.25	26	169 00
Hitchcock	24	1.70	40	260 00
Holt	13,329	1.20	15,994	103,961 00
Hooker	....	.....	....	....
Howard	1,057	1.10	1,162	7,553 00
Jefferson	4,419	1.30	5,744	37,336 00

TAME HAY, 1907—*Continued.*

COUNTY	Acreage	Av. Yield per Acre	Production Tons	Value
Johnson	31,470	1.43	45,002	$292,513 00
Kearney	1,616	1.05	1,696	11,024 00
Keith	86	1 05	90	585 00
Keya Paha	852	1.05	894	5,811 00
Kimball	6	.90	5	32 50
Knox	14,789	1.50	22,183	144,189 50
Lancaster	3,988	1.50	5,982	38,883 00
Lincoln	710	.96	681	4,426 50
Logan	60	.94	56	364 00
Loup	181	1.05	190	1,235 00
Madison	21,502	1.53	32,898	213,837 00
McPherson	....	.....	....	....
Merrick	4,536	1.64	7,439	48,353 50
Nance	9,946	1.35	13,427	87,275 50
Nemaha	33,301	1.40	46,621	303,036 50
Nuckolls	4,850	1.35	6,547	42,555 50
Otoe	47,758	1.75	83,576	543,244 00
Pawnee	26,711	1.25	33,388	217,022 00
Perkins	68	.75	51	331 50
Phelps	1,477	1.75	2,584	16,796 00
Pierce	15,611	1.80	28,099	182,643 50
Platte	14,834	1.55	22,992	149,448 00
Polk	10,816	1.55	16,764	108,966 00
Red Willow	169	1.35	228	1,482 00
Richardson	76,307	1.35	103,014	669,591 00
Rock	3,239	1.06	3,433	22,314 50
Saline	27,963	1.44	40,266	261,729 00
Sarpy	23,497	1.94	45,684	296,946 00
Saunders	44,751	1.80	80,551	523,581 50
Scott's Bluff	1,446	1.50	2,169	14,098 50
Seward	40,404	1.85	74,747	485,855 50
Sheridan	1,580	1.00	1,580	10,270 00
Sherman	1,338	1.65	2,207	14,345 50
Sioux	236	1.50	354	2,301 00
Stanton	12,529	1.56	19,545	127,042 50
Thayer	6,792	1.35	9,166	59,579 00
Thomas	74	.95	70	455 00
Thurston	4,907	1.35	6,624	43,056 00
Valley	1,500	1.20	1,800	11,700 00
Washington	44,563	1.65	73,528	477,932 00
Wayne	48,066	1.50	72,099	468,643 50
Webster	516	1.15	593	3,854 50
Wheeler	3,920	1.50	5,880	38,220 00
York	31,287	1.45	45,366	294,879 00

*Tame and wild hay not figured separately in 1906.
Value of tame hay figured at $6.50 a ton.

WILD HAY, 1907.

COUNTY	Acreage	Av. Yield per Acre	Production Tons	Value
The State, '07	2,347,478	1.04	2,394,025	$13,167,137 50
The State, '06	2,243,221	1.19	2,688,938	16,133,628 00
Adams	12,894	1.25	16,117	88,643 50
Antelope	48,120	1.25	60,150	330,825 00
Banner	....	.....	....	....
Blaine	12,815	1.00	12,815	70,482 50
Boone	39,911	1.36	54,278	298,529 00
Box Butte	8,728	.85	7,418	40,799 00
Boyd	15,693	1 30	20,400	112,200 00
Brown	21,515	1.20	25,818	141,999 00
Buffalo	32,623	1.00	32,623	179,426 50
Burt	10,729	1.65	17,702	97,361 00
Butler	27,810	1.25	34,762	191,191 00
Cass	9,974	1.25	12,467	68,568 50
Cedar	30,453	1.30	39,588	217,734 00
Chase	4,997	1.00	4,997	27,483 50
Cherry	128,794	1.08	139,097	765,033 50
Cheyenne	28,167	1.11	31,265	171,957 50
Clay	35,372	.95	33,603	184,816 50
Colfax	19,181	1.15	22,058	121,319 00
Cuming	31,642	1.00	31,642	174,031 00
Custer	60,378	1.00	60,378	332,079 00
Dakota	6,452	1.35	8,710	47,905 00
Dawes	3,693	.90	3,323	18,276 50
Dawson	40,015	1.30	52,019	286,104 50
Deuel	24,277	.90	21,849	120,169 50
Dixon	14,020	1.75	24,535	134,942 50
Dodge	28,820	1.25	36,025	198,137 50
Douglas	7,850	1.10	8,635	47,492 50
Dundy	8,820	1.00	8,820	48,510 00
Fillmore	32,454	1.00	32,454	178,497 00
Franklin	32,222	.95	30,610	168,355 00
Frontier	19,401	1.20	23,281	128,045 50
Furnas	5,022	1.10	5,524	30,382 00
Gage	23,382	1.15	26,889	147,889 50
Garfield	20,975	1.05	22,023	121,126 50
Gosper	8,755	1.12	9,805	53,927 50
Grant	25,557	1.00	25,557	140,563 50
Greeley	31,242	1.00	31,242	171,831 00
Hall	31,504	.90	28,353	155,941 50
Hamilton	27,200	1.10	29,920	164,560 00
Harlan	16,768	1.06	17,774	97,757 00
Hayes	1,633	.90	1,469	8,079 50
Hitchcock	1,605	1.20	1,926	10,593 00
Holt	195,624	.95	185,842	1,022,131 00
Hooker	....	.....	....	....
Howard	22,140	.80	17,712	97,416 00
Jefferson	21,488	1.00	21,488	118,184 00

WILD HAY, 1907—*Continued.*

COUNTY	Acreage	Av. Yield per Acre	Production Tons	Value
Johnson	10,824	1.15	12,447	$68,458 50
Kearney	14,171	.85	12,045	66,247 50
Keith	30,424	.85	25,860	142,230 00
Keya Paha	30,774	.85	26,157	143,863 50
Kimball	1,723	.75	1,292	7,106 00
Knox	44,649	1.10	49,113	270,121 50
Lancaster	114,822	1.20	13,778	75,779 00
Lincoln	47,281	.75	34,460	189,530 00
Logan	12,124	.73	8,850	48,675 00
Loup	3,920	.85	3,332	18,326 00
Madison	39,928	1.20	47,913	263,521 50
McPherson	....	.....	....	....
Merrick	30,767	1.30	39,997	219,983 50
Nance	14,116	1.00	14,116	77,638 00
Nemaha	5,143	1.10	5,657	31,113 50
Nuckolls	56,445	1.05	59,267	325,968 50
Otoe	10,886	1.25	13,607	74,838 50
Pawnee	18,323	1.00	18,323	100,776 50
Perkins	10,765	.60	6,459	35,524 50
Phelps	11,608	1.25	14,510	79,805 00
Pierce	39,268	1.35	53,011	291,560 50
Platte	18,980	1.15	21,827	120,048 50
Polk	13,417	1.05	14,087	77,478 50
Red Willow	14,234	1.10	15,657	86,113 50
Richardson	9,968	1.15	11,463	63,046 50
Rock	84,743	.95	80,505	442,777 50
Saline	26,796	1.20	32,155	176,852 50
Sarpy	5,662	1.32	7,473	41,101 50
Saunders	26,341	1.40	36,877	202,823 50
Scott's Bluff	9,792	1.15	11,260	61,930 00
Seward	16,060	1.25	20,075	110,412 50
Sheridan	54,760	.80	43,808	240,944 00
Sherman	59,790	1.15	68,758	378,169 00
Sioux	1,945	1.10	2,139	11,764 50
Stanton	24,845	1.24	30,807	169,438 50
Thayer	38,706	1.00	38,706	212,883 00
Thomas	170	.75	127	698 50
Thurston	7,157	1.10	7,872	43,296 00
Valley	21,931	.95	20,834	114,587 00
Washington	9,854	1.25	12,317	67,743 50
Wayne	13,992	1.00	13,992	76,956 00
Webster	46,468	.90	41,821	230.015 50
Wheeler	39,168	1.10	43,084	236.962 00
York	24,023	1.05	25,224	138,732 00

Value of wild hay figured at $5.50 a ton.

POTATOES, 1907.

COUNTY	Acreage	Av. Yield per Acre	Production Bushels	Value
The State, '07	87,900	71.24	6,262,220	$4,696,665 00
The State, '06	80,928	73.94	5,984,221	2,393,688 40
Adams	953	40.00	38,120	28,590 00
Antelope	1,136	94.00	106,784	80,088 00
Banner	202	67.00	13,534	10,150 50
Blaine	183	67.00	12,261	9,195 75
Boone	893	81.00	72,333	54,249 75
Box Butte	6,144	70.00	430,080	322,560 00
Boyd	654	82.00	53,628	40,221 00
Brown	879	130.00	114,270	85,702 50
Buffalo	1,052	69 00	72,588	54,441 00
Burt	665	114.00	75,810	56,857 50
Butler	948	60.00	56,880	42,660 00
Cass	1,045	70.00	73,150	54,862 50
Cedar	891	42.00	37,422	28,066 50
Chase	152	110.00	16,720	12,540 00
Cherry	1,734	94.00	162,996	122,247 00
Cheyenne	896	90.00	80,640	60,480 00
Clay	417	112.00	46,704	35,028 00
Colfax	698	50.00	34,900	26,175 00
Cuming	962	120.00	115,440	86,580 00
Custer	1,625	62.00	100,750	75,562 50
Dakota	2,579	60.00	154,740	116,055 00
Dawes	2,038	65 00	132,470	99,352 50
Dawson	779	84.00	65,436	49,077 00
Deuel	310	100.00	31,000	23,250 00
Dixon	857	100.00	85,700	64,275 00
Dodge	1,371	82.00	112,422	84,316 50
Douglas	7,961	81.00	644,841	483,630 75
Dundy	325	72.00	23,400	17,550 00
Fillmore	733	90 00	65,970	49,477 50
Franklin	691	25.00	17,275	12,956 25
Frontier	640	75.00	48,000	36,000 00
Furnas	757	25.00	18,925	14,193 75
Gage	1,207	50.00	60,350	45,262 50
Garfield	317	50.00	15,850	11,887 50
Gosper	459	48.00	22,032	16,524 00
Grant	24	65.00	1,560	1,170 00
Greeley	1,412	67.00	94,604	70,953 00
Hall	1,153	60.00	69,180	51,885 00
Hamilton	598	75.00	44,850	33,637 50
Harlan	545	38.00	20,710	15,532 50
Hayes	341	100.00	34,100	25,575 00
Hitchcock	256	75.00	19,200	14,400 00
Holt	1,759	79.00	138,961	104,220 75
Hooker	42	50.00	2,100	1,575 00
Howard	1,119	93.00	104,067	78,050 25
Jefferson	688	35.00	24,080	18,060 00

POTATOES, 1907—*Continued.*

COUNTY	Acreage	Av. Yield per Acre	Production Bushels	Value
Johnson	657	50.00	32,850	$24,637 50
Kearney	611	34.00	20,774	15,580 50
Keith	251	100.00	25,100	18,825 00
Keya Paha	395	75.00	29,625	22,218 75
Kimball	154	63.00	9,702	7,276 50
Knox	1,625	75.00	121,875	91,406 25
Lancaster	2,520	55.00	138,600	103,950 00
Lincoln	923	75.00	69,225	51,918 75
Logan	132	75.00	9,900	7,425 00
Loup	309	57.00	17,613	13,209 75
Madison	904	88.00	79,552	59,664 00
McPherson	....	....	....	....
Merrick	777	88.00	68,376	51,282 00
Nance	615	64.00	39,360	29,520 00
Nemaha	595	44.00	26,180	19,635 00
Nuckolls	672	32.00	21,504	16,128 00
Otoe	1,207	44.00	53,108	39,831 00
Pawnee	465	68.00	31,620	23,715 00
Perkins	260	100.00	26,000	19,500 00
Phelps	482	31.00	14,942	11,206 50
Pierce	793	85.00	67,405	50,553 75
Platte	1,246	63.00	78,498	58,873 50
Polk	427	61.00	26,047	19,535 25
Red Willow	858	42.00	36,036	27,027 00
Richardson	724	57.00	41,268	30,951 00
Rock	745	82.00	61,090	45,817 50
Saline	798	55.00	43,890	32,917 50
Sarpy	1,272	65.00	82,680	62,010 00
Saunders	1,169	58.00	67,802	50,851 50
Scott's Bluff	1,766	125.00	220,750	165,562 50
Seward	1,477	40.00	59,080	44,310 00
Sheridan	4,094	85.00	347,990	260,992 50
Sherman	624	40.00	24,960	18,720 00
Sioux	417	80.00	33,360	25,020 00
Stanton	664	85.00	56,440	42,330 00
Thayer	775	50.00	38,750	29,062 50
Thomas	130	90.00	11,700	8,775 00
Thurston	199	85.00	16,915	12,686 25
Valley	542	85.00	46,070	34,552 50
Washington	1,472	75.00	110,400	82,800 00
Wayne	903	85.00	76,755	57,566 25
Webster	1,014	45.00	45,630	34,222 50
Wheeler	192	70.00	13,440	10,080 00
York	955	55.00	52,525	39,393 75

Value of potatoes figured at 75 cents a bushel.

MISCELLANEOUS CROPS, 1907.

COUNTY	Spelts Bushels	Millet and Hungarian Tons	Sorghum Cane Tons	Sugar Beets Tons	Kaffir Corn Tons
The State, '07	1,375,748	235,128	203,339	30,609	18,020
The State, '06	2,092,203	....	....	....	....
Adams	2,865	571	3,146	....	27
Antelope	4,971	2,175	1,360	8	386
Banner	30,251	898	28	90	....
Blaine	11,066	288	166	110	....
Boone	15,971	2,623	2,409	290	255
Box Butte	4,445	2,151	67	42	....
Boyd	7,980	3,652	459	....	....
Brown	62,939	3,158	612	40	350
Buffalo	1,172	1,823	351	707	....
Burt	717	593	607	....	....
Butler	1,121	171	208	....	....
Cass	5,097	618	856	....	45
Cedar	4,095	4,367	420	....	....
Chase	37,044	4,134	7,485	62	135
Cherry	65,010	985	137	....	266
Cheyenne	65,560	1,748	232	752	504
Clay	3,015	832	2,112	....	5
Colfax	1,210	937	2	....	....
Cuming	4,636	2,551	1,008	....	56
Custer	28,920	14,460	1,320	53	14
Dakota	2,550	2,780	188	....	240
Dawes	71.495	845	50	....	....
Dawson	6,675	5,078	1,926	1,175	20
Deuel	65,612	1,905	534	434	....
Dixon	2,400	3,744	552	....	55
Dodge	4,547	1,398	247	72	....
Douglas	7,749	2,967	92	....	21
Dundy	14,841	3,955	14,805	304	302
Fillmore	1,512	722	1,961	....	33
Franklin	1,248	1,604	4,094	....	414
Frontier	19,478	16,757	14,172	....	342
Furnas	15,200	6,206	13,629	....	202
Gage	3,200	6,165	5,458	18	1,318
Garfield	5,693	568	476	20	36
Gosper	3,190	7,420	5,848	....	34
Grant	....	....	....	....	....
Greeley	97	13,042	236	....	....
Hall	....	1,106	2,729	5,378	56
Hamilton	1.320	865	1.083	49	12
Harlan	1,462	1.748	2,931	....	304
Hayes	7,711	4.937	11.494	....	38
Hitchcock	510	2.318	18.354	540	825
Holt	67,242	1,697	938	....	102
Hooker	1.000	....	....	....	....
Howard	4,636	2,966	447	9	30
Jefferson	1,200	10,670	4,611	135	1.027

MISCELLANEOUS CROPS, 1907—*Continued.*

COUNTY	Spelts Bushels	Millet and Hungarian Tons	Sorghum Cane Tons	Sugar Beets Tons	Kaffir Corn Tons
Johnson	6,517	1,825	777	....	175
Kearney	810	875	1,986	18	36
Keith	52,295	1,040	3,168	1,932	35
Keya Paha	54,911	2,739	750	....	35
Kimball	15,725	691	745	....	57
Knox	10,395	5,869	3,009	....	10
Lancaster	25,380	6,877	8,458	2,100	165
Lincoln	81,475	3,401	6,753	3,375	291
Logan	8,942	196	52	....	....
Loup	10,870	657	171	....	....
Madison	6,475	2,207	155	8	....
McPherson	....	....	....	....	....
Merrick	2,780	1,012	672	672	9
Nance	6,467	4,294	279	....	12
Nemaha	10,932	585	182	....	76
Nuckolls	1,684	3,869	5,617	....	775
Otoe	10,860	1,580	1,472	288	188
Pawnee	1,638	4,508	616	....	1,381
Perkins	57,125	2,205	2,212	214	71
Phelps	915	2,539	1,235	....	7
Pierce	21,030	1,312	265	8	12
Platte	6,030	2,712	324	140	....
Polk	717	39	247	....	2,760
Red Willow	9,131	3,649	14,019	5,790	2,050
Richardson	3,660	642	206	....	184
Rock	38,210	794	82	....	....
Saline	2,150	2,841	1,530	1,089	....
Sarpy	....	1,438	182	....	....
Saunders	2,095	1,615	5,388	....	9
Scott's Bluff	70,422	198	53	2,808	....
Seward	....	539	789	....	53
Sheridan	121,041	3,692	458	64	80
Sherman	3,724	2,169	589	39	6
Sioux	2,358	376	....	....	....
Stanton	14,181	3,308	359	....	203
Thayer	483	1,767	3,933	225	384
Thomas	7,000	225	169	....	....
Thurston	2,160	1,343	304	....	....
Valley	688	2,122	60	451	....
Washington	3.720	1 104	347	....	....
Wayne	10,495	2,200	114	40	....
Webster	6,739	3,239	5,340	900	1,410
Wheeler	14,325	409	145	100	28
York	1,080	228	287	....	64

LIVE STOCK STATISTICS

Showing Numbers as Returned by Assessors in Various Counties
April 1, 1907.

COUNTY	Cattle	Hogs	Sheep	Horses	Mules
The State, '07	2,799,583	2,436,251	310,974	798,705	58,974
Adams	19,609	29,112	927	11,527	1,108
Antelope	43,098	39,877	917	10,548	475
Banner	14,661	487	6,624	3,253	40
Blaine	8,803	1,328	802	1,942	74
Boone	37,686	41,882	1,407	10,541	944
Box Butte	27,633	1,538	7,104	6,012	185
Boyd	22,566	19,570	160	7,642	258
Brown	19,882	8,448	402	5,341	187
Buffalo	49,074	59,426	22,575	17,721	1,213
Burt	33,077	35,230	5,690	9,708	631
Butler	24,929	27,342	1,479	10,813	864
Cass	26,735	28,942	1,223	11,439	1,298
Cedar	54,483	61,740	1,462	13,065	537
Chase	13,753	9,529	464	3,590	453
Cherry	138,015	6,118	6,103	20,749	497
Cheyenne	45,366	2,269	3,417	11,372	301
Clay	19,222	27,839	1,169	11,524	1,250
Colfax	23,764	30,588	6,890	7,729	318
Cuming	48,966	64,778	1,658	10,102	655
Custer	104,931	115,120	3,128	30,719	1,241
Dakota	13,256	15,931	2,045	4,158	338
Dawes	43,975	2,274	20,600	8,239	123
Dawson	45,755	43,183	23,184	16,106	730
Deuel	52,562	5,215	1,295	7,561	267
Dixon	32,941	37,807	795	8,986	37
Dodge	37,306	40,507	13,362	11,248	578
Douglas	13,211	27,117	14,080	11,902	781
Dundy	16,339	11,771	36	5,511	462
Fillmore	18,936	32,617	1,437	10,224	766
Franklin	29,050	35,050	1,300	10,020	1,400
Frontier	30,996	32,561	106	11,334	680
Furnas	35,588	46,014	889	2,813	1,224
Gage	34,923	54,410	539	16,014	2,410
Garfield	13,083	5,608	751	2,743	131
Gosper	23,060	48,026	128	7,227	466
Grant	35,579	427	52	2,843	10
Greeley	24,460	23,330	501	6,473	241
Hall	34,495	25,080	11,536	9,432	1,035
Hamilton	29,560	38,346	1,700	10,946	1,022
Harlan	28,562	33,386	120	9,295	1,087
Hayes	15,408	17,226	57	4,825	406
Hitchcock	15,880	12,018	137	6,645	400
Holt	82,973	23,735	1,073	13,600	746
Hooker	7,634	604	304	1,428	38
Howard	34,357	30,161	76	6,897	405
Jefferson	28,981	35,713	7,028	10,429	1,216

LIVE STOCK STATISTICS—*Continued.*

COUNTY	Cattle	Hogs	Sheep	Horses	Mules
Johnson	20,281	32,479	4,455	8,566	1,095
Kearney	20,354	28,426	4,048	8,535	819
Keith	29,726	3,624	1,874	4,640	166
Keya Paha	22,903	11,853	122	5,958	281
Kimball	8,113	361	16,611	2,674	57
Knox	55,774	45,312	1,052	12,256	543
Lancaster	40,052	45,319	2,785	19,227	1,875
Lincoln	60,876	23,616	2,970	14,154	441
Logan	11,143	4,893	5	2,360	34
Loup	8,343	5,213	139	2,482	108
Madison	40,967	44,694	1,090	10,302	430
McPherson	20,868	1,441	529	2,896	74
Merrick	37,663	20,486	22,722	6,476	483
Nance	31,070	28,960	326	7,672	706
Nemaha	18,167	32,922	1,833	8,390	1,384
Nuckolls	30,932	37,658	1,661	9,497	1,223
Otoe	32,399	39,072	1,419	11,371	2,153
Pawnee	23,637	37,080	2,732	6,968	583
Perkins	15,191	5,670	6,257	3,715	185
Phelps	26,742	33,347	1,197	10,058	485
Pierce	34,726	28,073	699	8,277	313
Platte	40,793	46,595	917	11,883	637
Polk	22,470	33,065	3,774	9,300	749
Red Willow	23,951	34,270	4,634	9,195	734
Richardson	32,711	58,456	8,820	11,837	1,780
Rock	27,221	3,659	403	3,946	357
Saline	24,968	55,677	2,159	12,738	1,112
Sarpy	10,088	13,063	2,771	4,680	584
Saunders	38,162	41,050	2,633	14,619	1,070
Scott's Bluff	16,515	2,523	6,917	5,432	312
Seward	27,674	33,615	582	12,456	1,066
Sheridan	73,184	2,985	6,945	12,909	136
Sherman	27,148	27,395	410	8,360	447
Sioux	42,648	765	4,222	6,131	93
Stanton	33,786	34,432	974	6,167	392
Thayer	26,095	32,092	311	10,459	1,478
Thomas	5,340	1,005	30	1,187	31
Thurston	14,067	12,126	5,307	5,732	523
Valley	30,955	38,331	172	9,229	434
Washington	27,880	33,442	2,712	9,216	691
Wayne	33,704	38,575	2,670	8,357	403
Webster	32,761	49,439	745	10,759	1,297
Wheeler	14,191	5,675	789	2,419	105
York	28,194	38,507	749	12,984	1,177

Last assessed valuation, 1907: Cattle, $11.502,876; hogs, $3,738,639; sheep. $229,405; horses, $12.253.479; mules, $1,152,003; total $28,876,402. The assessed valuation is one-fifth of the real value.

TABLE

Showing Number Pounds to the Bushel, and the Amount of Seed Necessary for an Acre.

	No. Lbs. to Bu.	No. Lbs. to Acre.
Alfalfa	60	20 to 30
Alsike, Clover	60	6 to 8
Barley	48	48 to 96
Beans	60	75 to 100
Billion Dollar Grass	40	12 to 20
Buckwheat	52	25 to 50
Broom Corn	46	10 to 12
Brome Grass	14	25 to 40
Blue Grass, Kentucky	14	25 to 30
Blue Grass, English	14	36 to 48
Cane in Drills	50	6 to 8
Cane, for Fodder Broadcast	50	100 to 150
Clover, Alsike	60	6 to 8
Clover, Red	60	12 to 15
Clover, White Dutch	60	6 to 8
Corn	56	8 to 10
Corn, on ear	70	
Cow Peas	60	60 to 90
English Blue-Grass (Meadow Fescue)	14	36 to 48
Flax	56	28 to 42
Hemp	44	30 to 60
Japanese Millet	40	12 to 20
Johnson Grass	25	25 to 50
Kaffir Corn	50	50 to 100
Kentucky Blue Grass	14	25 to 30
Meadow Fescue (English Blue Grass)	14	15 to 30
Millet (except as noted)	50	25 to 50
Oats	32	32 to 64
Onion Sets, tops	28	
Onion Sets, bottoms	32	
Orchard Grass	14	25 to 30
Pearl Millet	56	5 to 8
Peas, field or smooth garden	60	90 to 120
Peas, wrinkled	56	
Peanuts	24	24 to 30
Pencilaria	56	5 to 8
Potatoes, Irish, good measure	60	480 to 600
Potatoes, sweet	50	
Rape	60	5 to 6
Red Top	14	20 to 30
Red Clover	60	12 to 15
Rye	56	72 to 90
Rye Grass, Italian	24	50 to 60
Speltz or Emmer	40	80 to 120
Timothy	45	15 to 20
Vetches or Tares	60	120 to 180
Wheat	60	60 to 90
White Clover	60	6 to 8

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